VOLUME XL NUMBER TWO

THE NATIONAL GEOGRAPHIC MAGAZINE

AUGUST, 1921

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The Wild Life of Lake Superior, Past and Present

GEORGE SHIRAS, 3d

With Frontispiece and 75 Additional Illustrations

Protecting the United States from Plant Pests

With 16 Illustrations CHARLES LESTER MARLATT

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IMMEDIATELY after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. Four expeditions have followed and the extraordinary scientific data resultant given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures. This area has been created a National Monument by proclamation of the President of the United States.

THE Society organized and supported a party, which made a three-year study of Alaskan glaciers.

GEOLOGISTS were sent to study the Mt. Pelée, La Soufriere, and Messina disasters.

AT AN expense of over $50,000 The Society sent a notable series of expeditions into Peru to investigate the traces of the Inca race. Their discoveries form a large share of our knowledge of a civilization which was waning when Pizarro first set foot in Peru.

THE Society also had the honor of subscribing a substantial sum to the historic expedition of Admiral Peary, who discovered the North Pole.

NOT long ago The Society granted $25,000, and in addition $75,000 was given by individual members through The Society to the Federal Government when the congressional appropriation for the purchase was insufficient, and the finest of the giant sequoia trees of California were thereby saved for the American people and incorporated into a National Park.

THE Society is conducting extensive explorations and excavations in Northwestern New Mexico, which was one of the most densely populated areas in North America before Columbus came, a region where prehistoric peoples lived in vast communal dwellings whose ruins are ranked second to none of ancient times in point of architecture, and whose customs, ceremonies, and name have been engulfed in an oblivion more complete than any other people who left traces comparable to theirs.

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HOW CHOOSING THE RIGHT WOOD EFFECTS THE CONSERVATION OF LUMBER

EVERY thinking man and woman today is appalled at the extravagant use of our natural resources during the early days of colonization in this country.

The price of much of our agricultural development was paid in a tremendous waste of our timber resources.

Countless acres were cleared and the timber burned to make way for crops. "Log Burning Bees" were common practice.

The lumber markets of the day were insufficient to absorb the vast amount of timber cut.

That was before the great agricultural, commercial and industrial development in this country had provided markets, and with those markets, a true measure of the value of our timber resources.

Today everybody believes in conservation in one form or another.

We strive to conserve our valuable resources. Lumber manufacture, as it exists today, makes possible the economical conversion of our timber into homes, farm buildings, factories and countless articles all of use and of service to mankind.

There is a duty to future generations in the practical conservation of our timber resources.

While the government is perfecting its forest policy, there is a very practical form of conservation that every user of lumber—whether for home building, on the farm or in the industries—can apply.

Lumber is too frequently bought on appearance, on price or a tradition that has grown up in an industry.

Too little attention has been given to the inherent qualities of the different kinds of lumber and their special fitness for the service they are asked to perform.

The waste today in the thoughtless, indiscriminate use of lumber mounts into the millions of board feet—25%, 50% or 75% service rather than the 100% that lumber, properly selected, is able to deliver.

The elimination of this waste through a broader lumber intelligence will go a long way toward solving the question of our future lumber supply and in making more effective the forest policy of the Nation.

What we advocate is conservation and economy through the use of the right wood in its proper place.

To this end we will supply to lumber dealers and to the public, any desired information as to the qualities of the different species and the best wood for a given purpose.

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BUSINESS concerns may be divided roughly into two classes. One goes on the idea that the public doesn't think much. The other believes that public good sense makes the right decision nine times out of ten.

Concern No. 1 likes to keep away from *facts*. Concern No. 2 is anxious to place *all the facts possible* before people.

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* * *

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* * *

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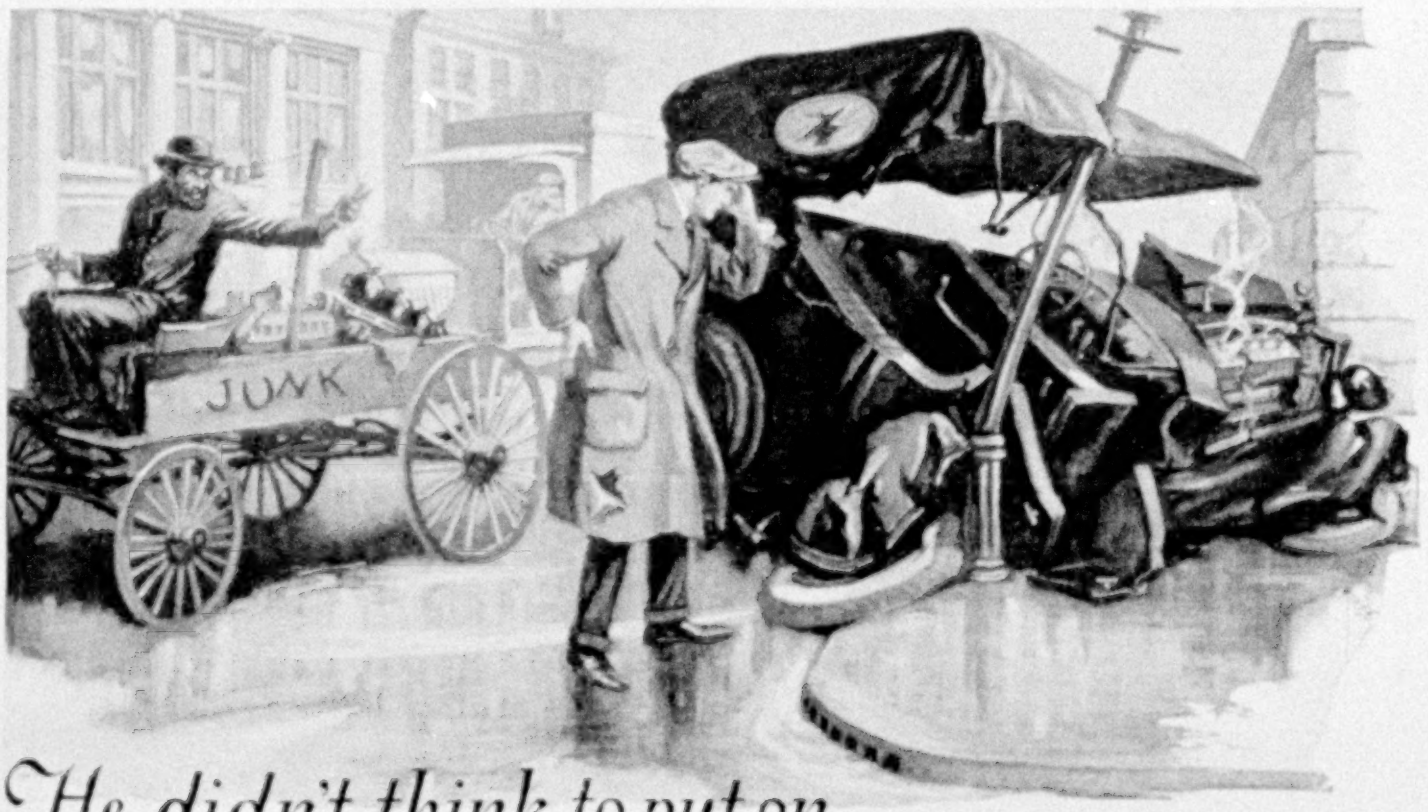

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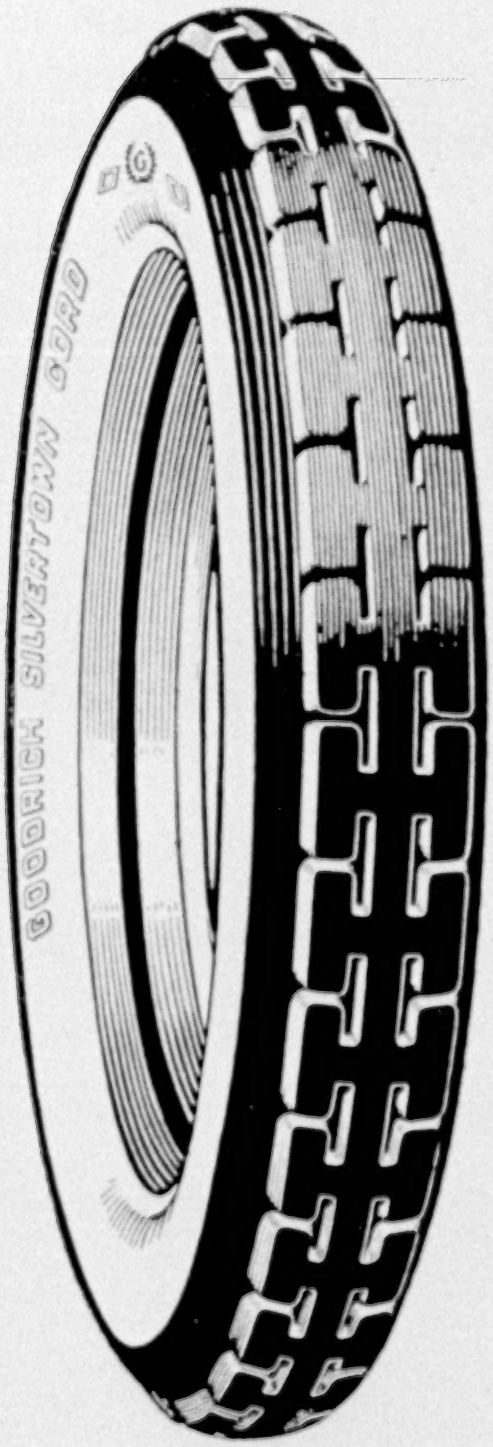

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32×4½	$47.30	$4.50
33×4½	$48.40	$4.65
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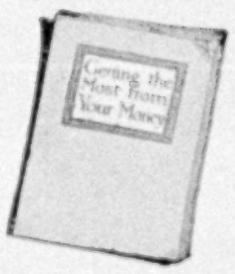

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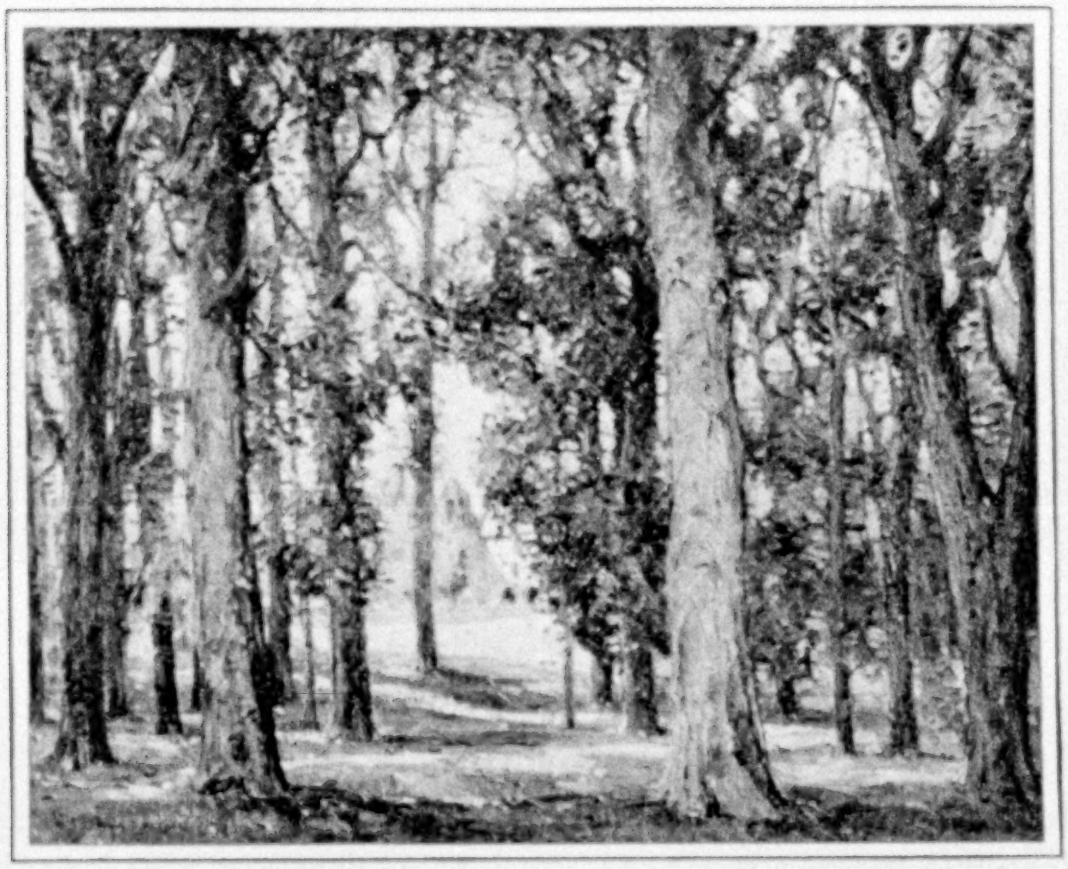

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HAR

One of a group of four night pictures first establishing the beauty and

Photograph by George Shiras, 3d

HARK!

uty and accuracy of the camera and flashlight in big-game photography.

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VOL. XL, No. 2 WASHINGTON AUGUST, 1921

THE NATIONAL GEOGRAPHIC MAGAZINE

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THE WILD LIFE OF LAKE SUPERIOR, PAST AND PRESENT

The Habits of Deer, Moose, Wolves, Beavers, Muskrats, Trout, and Feathered Wood-Folk Studied with Camera and Flashlight

BY GEORGE SHIRAS, 3D *

AUTHOR OF "PHOTOGRAPHING WILD GAME WITH FLASHLIGHT AND CAMERA," "WILD ANIMALS THAT TOOK THEIR OWN PICTURES BY DAY AND BY NIGHT," "ONE SEASON'S GAME-BAG WITH THE CAMERA," "A FLASHLIGHT STORY OF AN ALBINO PORCUPINE AND OF A CUNNING BUT UNFORTUNATE COON," "THE WHITE SHEEP, GIANT MOOSE, AND SMALLER GAME OF THE KENAI PENINSULA, ALASKA," AND "NATURE'S TRANSFORMATION AT PANAMA," IN THE NATIONAL GEOGRAPHIC MAGAZINE.

CHAPTER I

LAKE SUPERIOR is nature's greatest reservoir of deep, pure water in the world. Four hundred and fifty miles long, one hundred and sixty-seven miles wide, having a maximum depth of a thousand feet, its bottom four hundred feet below sea-level, with some two hundred tributary streams and the greatest snow precipitation east of the Mississippi, this great crescent-shaped basin has remained at the same level for centuries.

Overflowing, in a series of tumultuous rapids, the rock-rimmed shore at the eastern end, the excess waters have channeled out the beautiful Sault Ste. Marie River, with its wooded islands and many bays, passing thence through straits, rivers, lakes, and a great estuary to the sea, two thousand miles away.

PRIMITIVE ROCKS AND VIRGIN WATERS

The ancient formations of Lake Superior are grouped into three great divisions — the Archean, Algonquin, and Cambrian — each separated by unconformities of great magnitude. While of interest to the geologists, for here are the finest iron and copper deposits in the world, besides marble and granite, slate and sandstone, the basic divisions may be treated as rocks of crystalline and sedimentary origin.

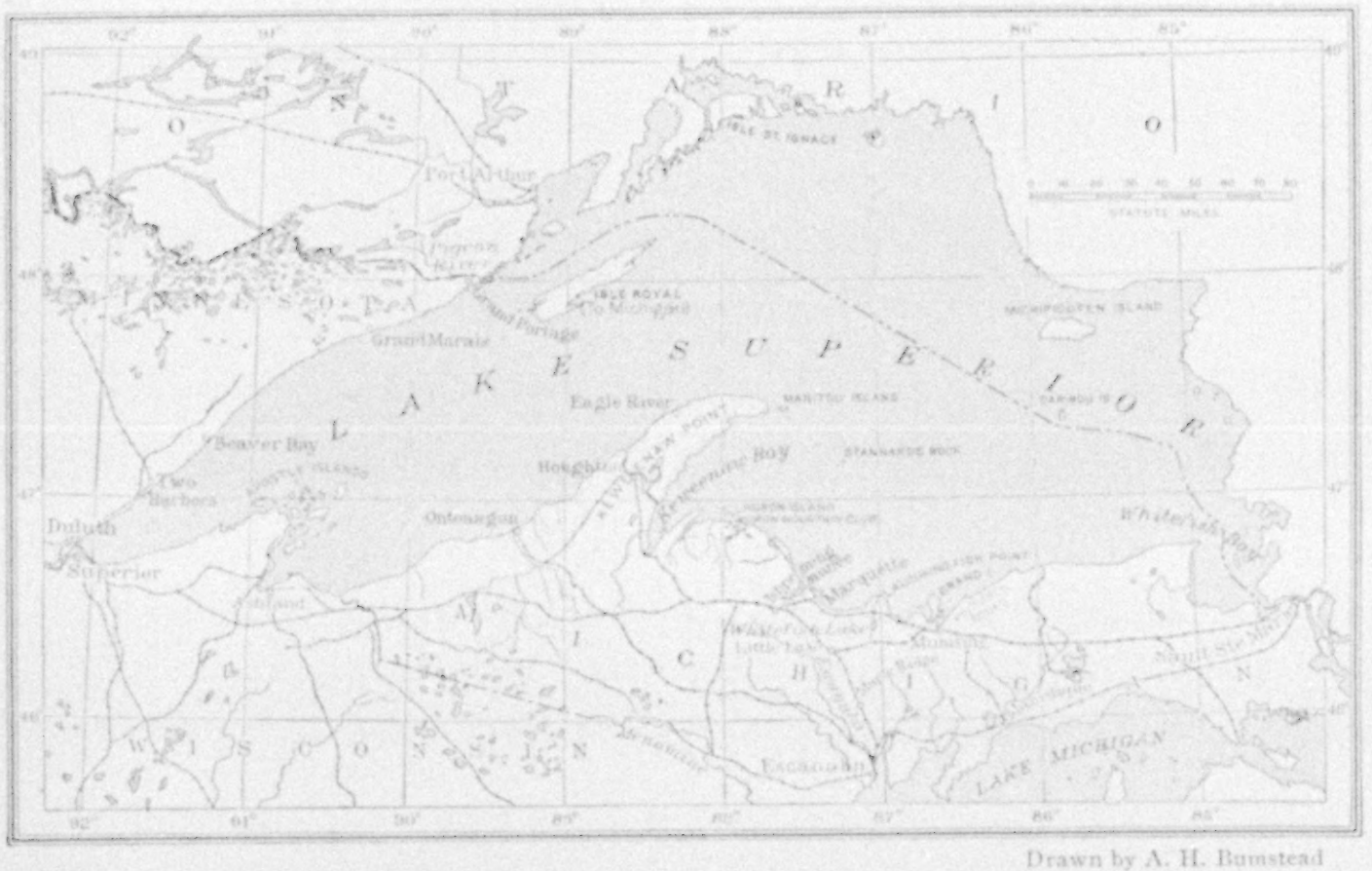
Included in the latter is the "Lake Superior sandstone," unique in containing little or no fossil remains, indicative of its early formation.

The surfaces of the primary rocks are heavily scored by glacial action, while the overlying strata of sandstone, often many thousand feet thick, have been fashioned by the elements into fantastic and impres-

* In 1849 the paternal grandfather of the author visited Lake Superior to fish for speckled trout, at a time when there was only a scattered settlement or two, and before a lock had been constructed around the rapids at the head of St. Marie's River. In these vast waters he fished until his 89th year.

Then in 1859 came the father, as a fly-fisherman, later a Justice of the United States Supreme Court, who now, in his 90th year, continues his annual visits.

Finally came the author in 1870, who herein describes his own experiences of fifty years, first with the rod and gun, and then with the camera and flashlight, which brought to the sportsman and the naturalist a new pleasure and a new means of studying and photographing wild life.—EDITOR.



Drawn by A. H. Bumstead

A MAP OF LAKE SUPERIOR SHOWING NORTHERN MICHIGAN AND WISCONSIN, EASTERN MINNESOTA, AND WESTERN ONTARIO

Among the points of interest mentioned in the narrative and indicated on the map are: Marquette, Whitefish Lake, Grand Island and Pictured Rocks, St. Ignace Island, and Stannards Rock.

sive shapes, resembling battlements and turreted castles, separated by high, perpendicular cliffs of variegated colors.

These cliffs contain caverns into which the larger craft may enter. One group on the southern shore is known as the "Pictured Rocks," originally the most famous of our natural phenomena, but now somewhat overshadowed by the magnitude and diversity of the Rocky Mountain region though still without a counterpart in coastal scenery (see pages 116, 117, 118, and 144).

In topography and scenic beauty the north shore resembles somewhat the southern shores of Alaska, for it is elevated, rock-bound, with many clear, turbulent trout streams cutting through the dark coniferous forests and plunging down the steep water-shed into the crystalline waters below.

WILD LIFE ON THE ISLANDS

Here is also an archipelago of wooded islands, some surmounted by rocky domes of a thousand feet or more, the larger containing moose, deer, caribou, and bear, between which and the main shore are deep, tortuous channels and many safe harbors, affording ideal cruising grounds for the sportsman and tourist.

The south shore resembles more the northern Atlantic coast, with here and there precipitous cliffs and rocky promontories, separated by long stretches of sand beaches and deep bays, the islands and harbors infrequent.

PRIMEVAL FORESTS AND SUCCESSIVE GROWTHS

Circling the coast, the forests are much the same, except that the rotund spruce of Ontario is replaced on the Michigan shore by towering hemlocks, the roots of which turn the streams into a deep wine color; so that the speckled trout, in darker hues of brown, red, and orange, are in characteristic contrast with the silver and pink of those in the lake.

When travel by water was the principal means of seeing the lake country, it was assumed that upper Michigan was a vast pinery, for its shores and the interior streams were fringed with green through-

DOME-SHAPED LODGE OF THE OJIBWAYS

The Indian to the right is Chief Kawbawgam, who with his family lived on Presque Isle, now a suburban park of Marquette. He reached the unusual age of one hundred years, and now a large boulder is his monument in the park. The standing figure at the left is Jack La Pete, who acted as guide for four generations of the author's family. He died in his ninety-eighth year. Such longevity was most unusual among these Indians.

out the year, and visible in the open months were the buoyant pines floating down many streams to be rafted on the lake for the eastern market.

When the railways and the logging roads reached the higher ground, extraordinary forests of hardwood were discovered, consisting of millions of acres of sugar or hardwood maple in solid stands, with an abundance of beech, yellow birch, basswood, ash, and elm, resulting in the development of many woodworking establishments and the largest wood charcoal furnaces in the world (see page 122).

The abundance of sugar maples at the present time warrants a syrup production exceeding Vermont and New Hampshire, where generations of thrifty farmers have tapped every scattered grove in conserving nature's sweetest offering.

Nowhere, probably, on the continent is the fall foliage more beautiful in brilliancy or contrasting colors. Much of this gorgeous display is of recent origin, for with the removal of the older forests, the increase of rural clearings, and the unending vistas of the interior driveways came a second growth of low-branched, symmetrical trees, one of which, the soft maple, is spreading rapidly; for, when cut to the ground, from the stump springs a spray of green saplings, in the autumn turning to a fountain of pink and red, many of the leaves splotched like a painter's palette.

Equally abundant is the yellow-leafed poplar, fluttering in the slightest breeze, while the bronzed beeches and the lavender of the wild cherry are interspersed with the mountain ash, bending beneath

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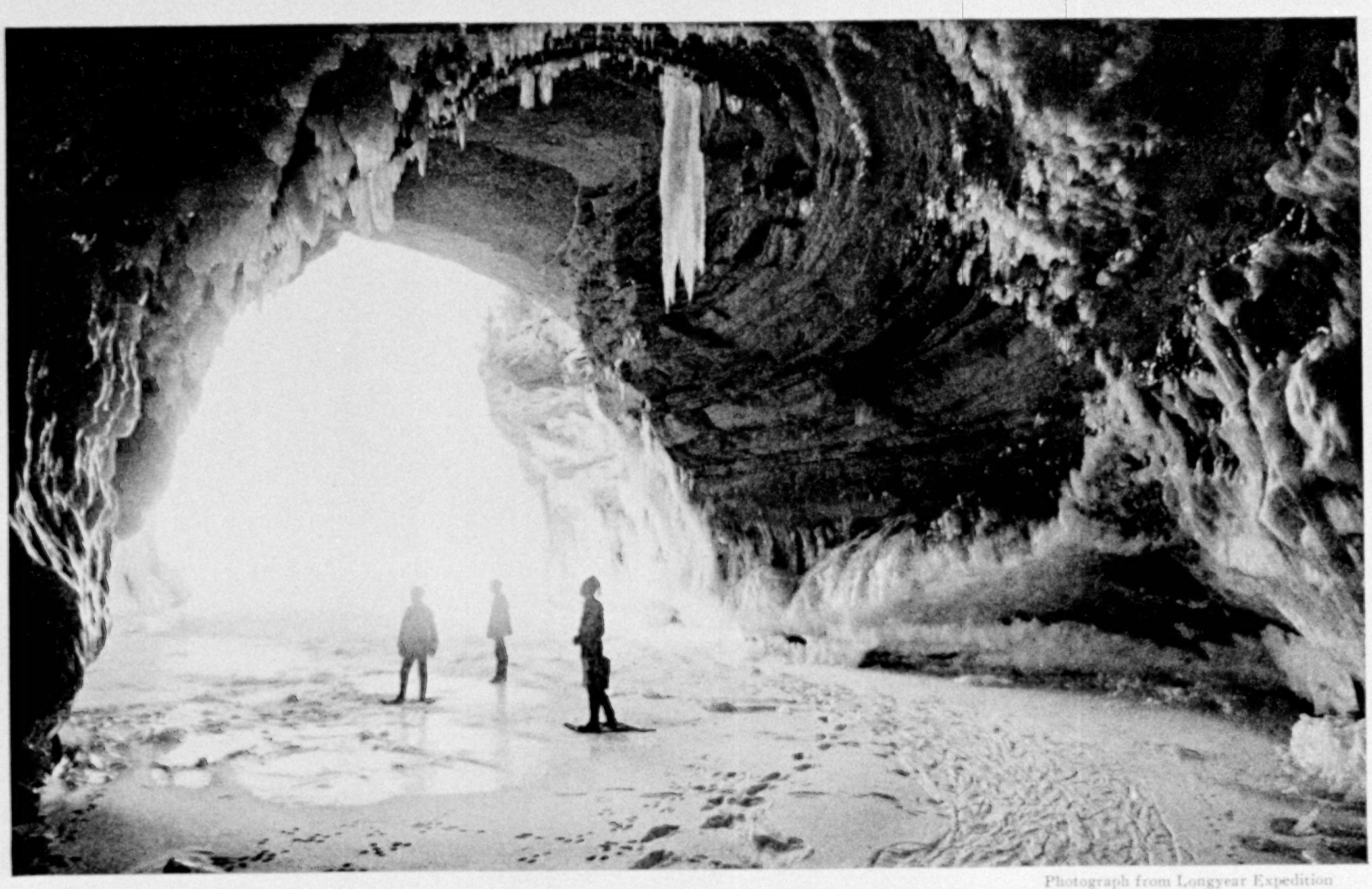

Photograph from Longyear Expedition

WINTER'S HANDIWORK: PICTURED ROCKS

In the summer the transparent waters disclose the curved bottom of this rotund and gloomy cavern. When winter paves the floor in white, fills the lower crevices with ice, and forms pendant prisms on the arched entrance, the transformation is one of radiance and beauty.

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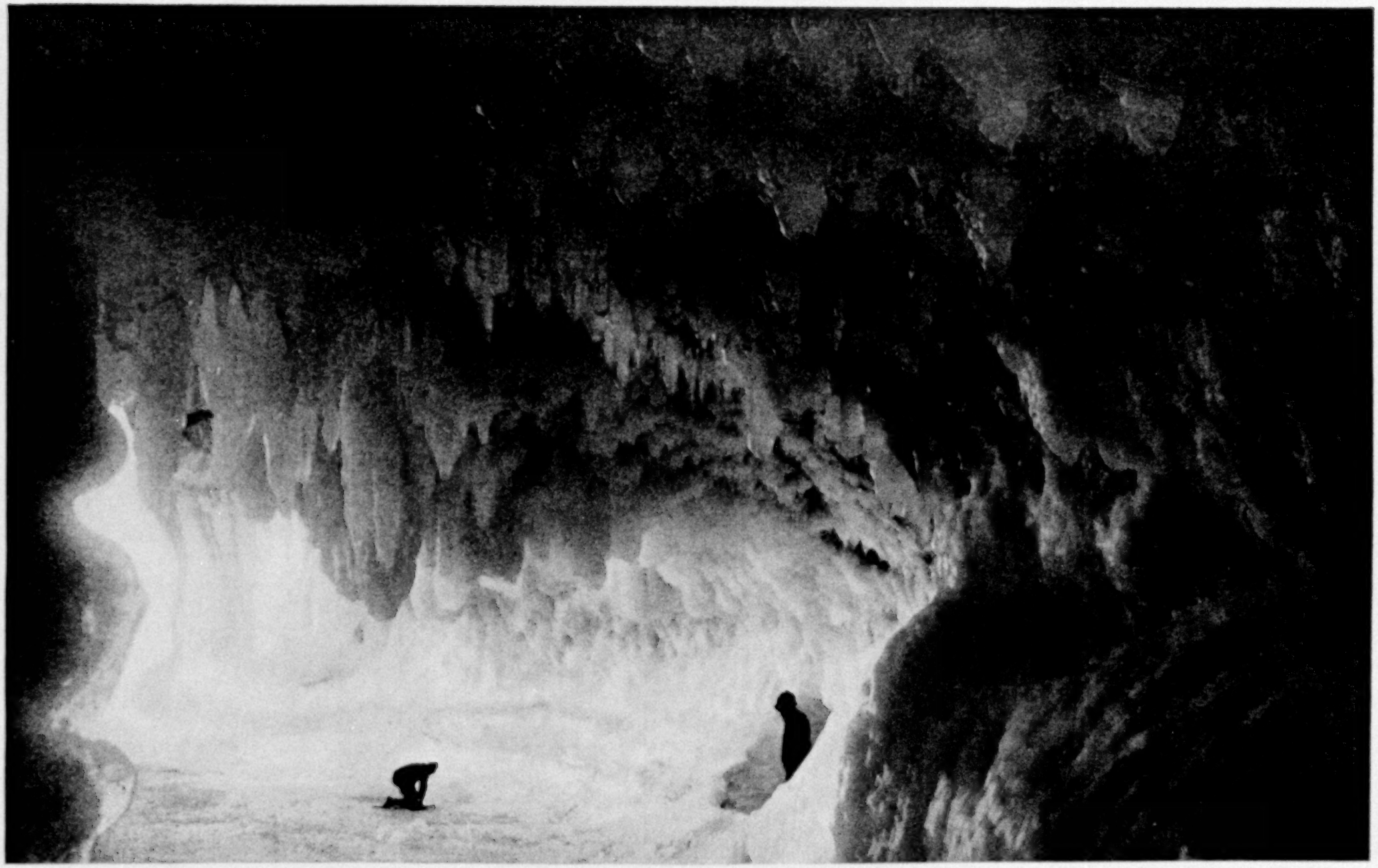
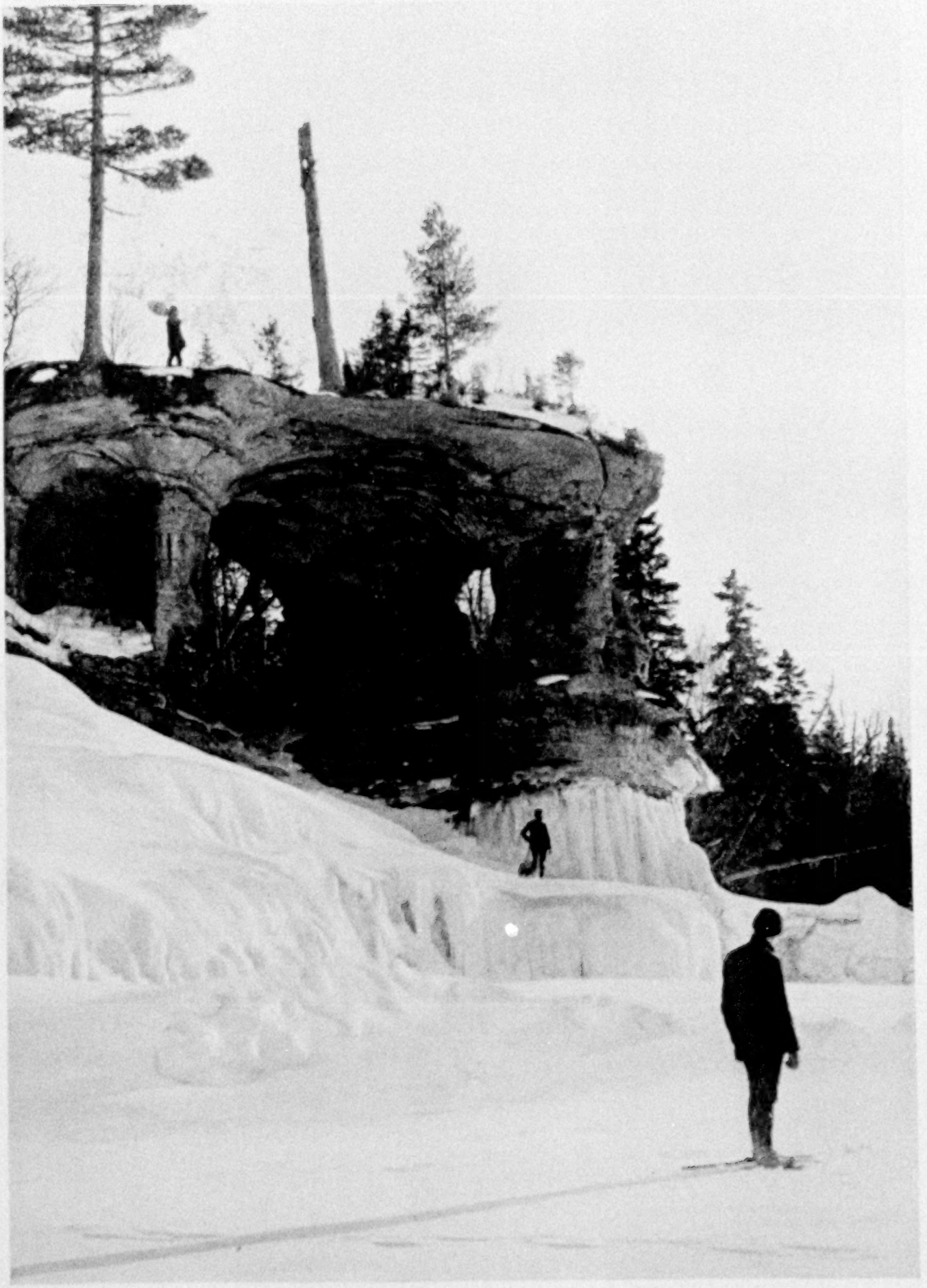


Photograph from Longyear Expedition

GRAND PORTAL: PICTURED ROCKS

A winter view of a large cavern in the variegated sandstone cliffs east of Grand Island, where surging waves have formed a wainscoting of ice, and a myriad of stalactites on the domed ceiling. Occasionally the ice contents remain until July first.



MINER'S CASTLE; PICTURED ROCKS

With the base resembling Carrara marble, this striking design of Nature has been much changed in winter.

its clusters of red berries, the more brilliant hues alternating with the contrasting greens of the balsam and cedar, and back of which often lie great uncut forests of hardwood maple in a monotone of orange, the edgings carpeted with the crimson hether of huckleberry, while daisies, goldenrod, and giant ferns join in the culminating efforts of the ebbing year.

The interior lakes and ponds present the climax of this hectic season; for nature, flushed with intermittent frosts, duplicates its colors on the mirrored surfaces, all domed with the azure of the northern sky.

THE OJIBWAY INDIANS

Lake Superior was thoroughly explored and was a busy field for the Jesuit missionaries long before any other portion of the western country had been visited by the white man, for the hardy *voyageurs* used the great watercourse from the sea when settlements on the Atlantic coast were few and far apart.

In 1658 Radisson, the fur trader, gave the first written description of the south shore, followed in 1660 by Father Menard, in 1665 by Allouez, and in 1669 by Marquette. Some evidence exists for believing that this region was visited by white men long before these dates, it having been asserted by Chase S. Osborn, former Governor of Michigan, that so far back as 1542 Roberval's men penetrated thus far.

Among the first of the resident Indians on Lake Superior were the Ojibways, commonly called Chippewas. Belonging to the Algonquins, it is supposed they were driven west, along the Great Lakes, by the more warlike Iroquois, and on reaching the terminal waters found the Sioux, a tribe of similar habits and disposition, in possession.

Then ensued a bitter warfare; but the Ojibways, having a continuous supply of guns and ammunition from the east, drove their rivals out on the prairie country, where they became pony Indians, changing their habits materially.

The dividing line between these contending forces was Minnesota, the wandering trapper being able to recognize the different tribes by the tall, conical-shaped lodges of the Sioux and the low-domed ones of the Ojibways (see p. 115).

Hunting, fishing, trapping, and the use of the birch-bark canoe developed self-reliance and a habit of occupying more or less permanent locations within sight of the water, in contrast to the nomadic life of most western Indians.

THE INDIANS LIVED LARGELY ON FISH

In the early days there were neither moose nor deer and very few caribou, compelling the aborigines to live largely on fish, which were easily obtained from the Sault Ste. Marie River, where the rapids remained open during the winter, and here was established their largest village, bringing them into contact with travelers, whom they served as guides and packers. They were recognized as the most dependable and responsive members of their race, for early intercourse with the missionaries prepared them to welcome the white man as a friend.

At the present time the Ojibways have practically disappeared from the south shore, but are still to be found in considerable numbers throughout western Ontario and northeastern Minnesota, where the abundance of fish and game, supplemented by an annual pension from the United States and Canadian governments, favors their existence. Under conditions very similar to those of a hundred years ago, sportsmen and tourists are given an insight into the life of the tribe which inspired the story of Hiawatha.

CHAPTER II

FIRST OUTINGS TO LAKE SUPERIOR

In 1869 I was presented with my first gun, a small-bore, muzzle-loader, with which, under parental instruction, I was able to bag a few squirrels, quail, and rabbits in the wooded country below Pittsburgh, on and near the banks of the Ohio.

This gift was in view of a coming trip to Lake Superior the following year, where I was to be permitted to travel on ancestral trails to a region of hearsay, and to see with my own eyes this wonderful body of water and tributary streams, the great forests of pine and hardwood, the picturesque Ojibway Indians in their birch-bark canoes, and, more than all, the trout, grouse, wild pigeons, deer, bears, wolves, and many fur-bearers which

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tenanted the streams and arboreal retreats of a pristine wilderness.

Fated to continue on and on in this inherited privilege, half a century has now passed in a study of the wild life in a great homogeneous area, where the extinction or marked declination in certain forms have been compensated by the gradual appearance of species new to the region, accompanied by the gradual increase of some of the more valuable birds, animals, and fish so improvidently decreased in pioneer days.

Anxious to see the surrounding wilderness, a chance came to me when a family party started on a camping trip to the mouth of Huron River, fifty miles to the west of Marquette, a remote portion of the southern shore, where there was not a single habitation between the town and the camping place.

Transported by steamer to within five miles of the shore, several yawls, with canoes in tow, were soon under way. Passing the Huron Islands, dotted white with nesting herring gulls, among the first of the northern bird refuges to be established by President Roosevelt thirty-five years later, we landed in a small clearing near the entrance to the river, where the tents were erected, and then began ten most interesting days beneath the canvas.

INDIAN GUIDES OBJECTS OF INTEREST

The Indian guides were, perhaps, the object of greatest interest, for they gave much attention to the two young members of the party, whose incessant questions were only equaled by raids on the provision tent.

Trout, grouse, and pigeons were abundant and many deer tracks along the banks indicated what might be done in the hunting season.

Among the guides was one first employed by the writer's grandfather in 1850. His swarthy complexion and comical expression led to his being called Jack La Pete, through a supposed resemblance to the Jack of Spades (see page 115). Jack was small, thin, and active, with a volubility in striking contrast to the taciturnity of his race, a trait possibly due to a trace of Hibernian blood, for in other respects he resembled the Ojibway Indians.

During long contact with the better class of pioneers, who were intent upon the permanent development of a country rich in minerals and timber, and often acting as guide to those seeking to enjoy the abundance of game and fish, Jack became possessed of a greater knowledge of worldly affairs than any of his associates, and the fact that he had spent a year in Washington as interpreter in litigation affecting his tribe added further prestige.

About the camp-fire in the evening he made us little birch-bark canoes initialed with the quills of the porcupine, while the spreading tail of the grouse became a fan and the skin of a muskrat was made into a shot-pouch. In conversation he was equally active, and told many weird tales, including a personal interview with the great Manitou, who on one occasion came down the clay chimney of his cabin and with a mysterious incantation restored Jack's failing eyesight.

A NIGHT'S CAMP AT THE MOUTH OF DEAD RIVER

Being much impressed with the experiences of the first camp, three boy companions between the ages of nine and twelve were selected for a one night's visit to the mouth of Dead River, several miles north of town. The enterprise was to be undertaken without the assistance of guides or elders, so prone to interfere with the freedom of youth.

Marquette, like most early communities of the north, had no suburbs, and when one stepped out of the backyard, there began the domain of the wild, for the rigorous winters, deep snow, and lack of conveniences deterred any but Indians living outside the settlement.

Assisted up the beach by a one-horse wagon, the outfit was deposited beside a pyramidal rock where the river entered the lake, at which place there was plenty of drift-wood for a continuous camp-fire, axes being barred as well as guns, and, moreover, no one was to wade the shallow river on account of quicksands and because the pathless swamps and dense forests beyond were reported to be occupied by beasts having a particular preference for small boys.

The tent, when erected, leaned much to one side, in response to a crooked pole;

Photograph by George Shiras, 3d

FLASHLIGHT OF AN ALBINO PORCUPINE

For seven consecutive summers this animal was photographed at night in the same bay on Whitefish Lake. (See "A Flashlight Story of an Albino Porcupine and of a Cunning but Unfortunate Coon," June, 1911, NAT. GEOG. MAG.)

but this was deemed a virtue, according to one of the party, because the sagging canvas would keep our feet warm, the coverings consisting of a single blanket each.

COOKING UNDER DIFFICULTIES

The remaining part of the day was spent in fishing, and after the trout were cleaned and an indescribable batter prepared for the flapjacks, it was discovered the lard and butter had been left behind. But burned fish and flapjacks pried off the frying-pan with a knife were not discouraging, for there was an abundance of jam, bread and cookies, and in the tent was a large beefsteak for breakfast, which, in the absence of grease, would now be broiled on a spit before the fire.

As dusk approached, a roaring sound came from the interior and gradually grew louder. The suggestion that it was a great forest fire sweeping toward the lake and would soon engulf us nearly sent the party scampering home, but the absence of either smoke or flame seemed to upset this prediction, and the mystery was left unsolved.

The wind, shifting from the lake to offshore, had brought in hearing the sound of some large falls; but such a simple explanation was not in the minds of youths about to spend the night in the region, growing more fearsome as the camp-fire accentuated the oncoming darkness.

It fell to my lot to occupy the front of the open tent, but as the warmth of the fire had advantages and the glare would keep away the prowlers of the night, I was soon asleep with the rest. About midnight the fire burned low, and to keep warm the blankets were drawn over the heads of each.

TERROR IN THE TENT

Suddenly I heard a snuffling sound beyond the tent, and then a couple of heavy feet pressed down on the blanket, followed by some animal seizing the package of meat and dragging it away.

Still enveloped in the covering, I man-

Photograph by George Shiras, 3d

A RACCOON FIRES THE FLASHLIGHT

Twenty-five years ago this omnivorous animal was unknown on Lake Superior, but on the coming of the second growth clearings and farming settlements it has taken up a permanent abode. (See "A Flashlight Story of an Albino Porcupine and of a Cunning but Unfortunate Coon," June, 1911, NAT. GEOG. MAG.)

aged to roll over the recumbent figures, shouting, "Bears! Bears!" until the closed end of the tent prevented further progress. Then there was a jumble of outcries and an effort made to occupy the same place in the rear, followed by the rapid firing of a revolver toward the opening by one of the party, who declared in excited tones that the prohibited weapon had been brought along for just such an occasion, for he knew we were in a country filled with dangerous animals.

Under the protection of this weapon, the fire was replenished, and then at the edge of the swamp appeared the glowing eyes of wild creatures held at bay by the blazing logs, for the flittering fireflies above the moist ground were sufficiently realistic at this juncture to deceive all.

At daybreak the camp was abandoned, but not before large tracks were noted on the sandy beach. When each appeared at his respective home before any one had arisen, it was discouraging to be told that our visitor was, of course, only a stray Indian dog.

THE WORLD'S LARGEST CHARCOAL FURNACE

As showing how this particular camping place changed, it may be noted that the largest charcoal furnace in the world is now in operation on one side of the river, which is spanned by a steel bridge, and just beyond is the largest concrete ore dock on the Great Lakes, where leviathan freighters six or seven hundred feet long have replaced the birch-bark canoe. A shore driveway, with its multitude of automobiles, occupies the sand beach which once registered the tracks of many wild animals—and others not quite so wild, but equally fond of rare steak.

Early in August one of my youthful companions of the previous camp learned that two miles south of the town and

Photograph by George Shiras, 3d

CEDAR WAXWINGS NEAR THE CAMERA

In July, 1892, while watching for deer, cherry-birds were observed flying over the water after white millers. A stick with branches at right angles was placed near the blind and a camera, with a pulling string attached, was set up only three feet away from the perch. Soon a single bird was pictured; then two, and finally the three shown above.

several hundred yards above the mouth of Carp River was a salt lick much frequented by deer, for the valley beyond was a wilderness, visited only by a few trout fishermen early in the season. The animals came down the well-forested stream to the lick almost in sight of the highway following the lake shore.

Here, accompanied by a colored servant, he was placed on the top of a scaffold facing a salted log and within an hour had killed a deer, using a Martini-Henri carbine, the forerunner of the modern repeating rifle.

Then ensued great excitement among the boys of the neighborhood, and it was deemed a special honor when I was selected to try for a deer in company with the successful hunter, the exact location of the lick being unknown to the rest of us.

Several days later, on reaching the place, I found a high scaffold supported by four poplar trees and ascended by a rickety ladder, the general appearance indicating that it had been used as a convenient spot for killing deer by some one who found it unnecessary to go much beyond the town limits for his venison.

An old log had been bored full of auger-holes and filled with salt, so that each rain caused the salt water to overflow, keeping the lick continuously fresh. For about ten feet on each side of the log the trees had been removed, giving a full view of any animal standing in the opening.

A TRAGEDY AVERTED

By agreement I was to fire the shotgun first, followed by the carbine to insure getting the deer. Little time had passed when a twig cracked and both guns were trained on the log, ready for immediate

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action. Then a dark figure appeared and bent over the log, fortunately recognized, however, as a human being and evidently the proprietor, from the manner in which he examined the premises for signs of deer.

Had he looked skyward and seen the battery trained in his direction and the trembling fingers pressed against the triggers, he would doubtless have had some concern. However, he soon withdrew, and again we awaited expectantly, when, suddenly and without sound, a deer was seen standing on the opposite side of the log, with ears erect and nostrils twitching in an effort to detect any danger.

Counting three, the shotgun was fired, followed a moment later by my companion's, and then the animal whirled and was gone as silently as it came. Descending, we found that the deer had crossed the stream, and after trailing it some distance without finding any traces of blood, we returned much disappointed.

Just at dusk, on preparing to leave, a deer whistled near by, showing that so much tramping about the vicinity had given the needed warning. Much crestfallen and somewhat sensitive to my companion's declaration that had he shot first, there would have been a dead deer, I returned to town, wondering if such a favorable chance would ever occur again.

For more than fifteen years the State penitentiary, a huge brownstone building, has stood on the bank of the river just above where the lick was, and now some five hundred convicts gaze wistfully upon the still peaceful valley in which the unfettered creatures of the woods continue to roam.

THE DISCOVERY OF WHITEFISH LAKE

Several days later old Jack came shuffling along, looking for a job. When he heard of the unfortunate adventure with the deer, he told how he had discovered, two years before, a beautiful little lake away back in the unexplored forest, twenty miles east of his place, where deer were so abundant that one could be killed at any hour of the day or night.

Naturally, this excited my interest, and after further questioning I learned that in the summer of 1869 he had been employed as a mail-carrier by surveyors looking over a route for a railroad between Marquette and a point on Lake Michigan. When the preliminary survey reached a long, deep gorge, impracticable to bridge on account of the excessive cost, the project was given up.

Jack, however, noting the stream flowing through this valley and the possibility of finding good trapping ground for the ensuing winter, followed the gorge down until he came to a lake about a mile in length, where he saw many deer and much evidence of fur-bearers.

Later he built a half-way shelter at the head of Sand River and a larger one at the lake, where he had a season of successful trapping. Further, it was unnecessary in making this trip to carry anything but a couple of blankets, a gun, and a few provisions; for, besides the cooking outfit at both places, he had an abundance of maple sugar which could be used for tea or made into syrup for flapjacks.

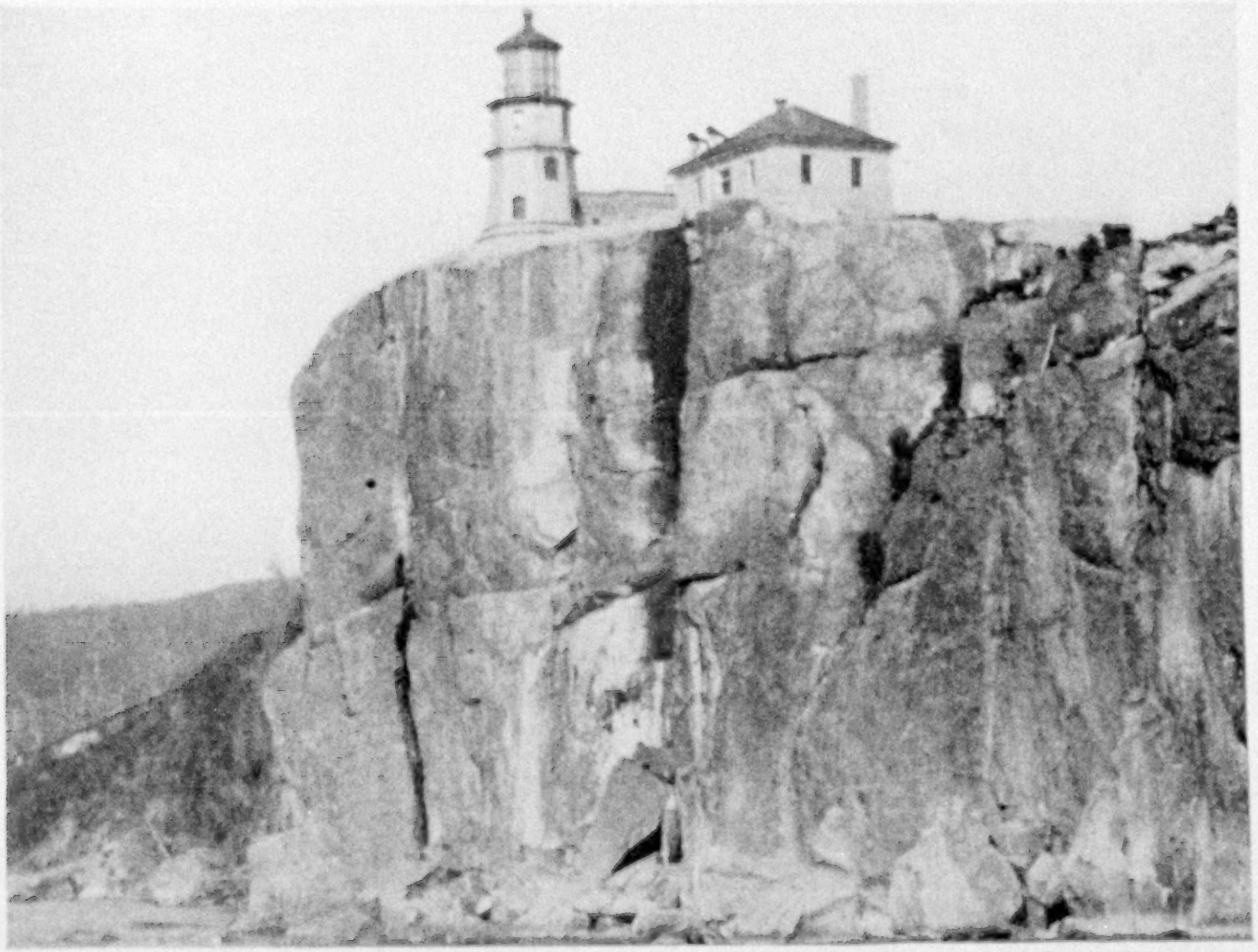
THE BEGINNING OF FIFTY YEARS' VISITS TO THE NEWLY FOUND LAKE

During the second week of August, 1871, with my young brother as a companion, we were driven in a buckboard to an Indian cabin ten miles to the south, near the Chocolay River, where an uncomfortable night was spent on the attic floor alongside several aged and ogress-like squaws.

After a hasty breakfast the packs were adjusted according to the strength of each, and a start was made on a fairly good trail to the river, after wading which the course was determined by trees blazed the year before. The direction was easterly along a maple ridge interspersed with hemlock, where absence of undergrowth made the traveling easy, the few swamps having deer trails that avoided all mud-holes and fallen timber.

At noon the headwater of Sand River was reached, where the little lean-to of Jack's was to be occupied that night. The packs, light as they were, had told on the two very youthful members of the party.

While the lunch was being prepared, the sight of the little stream suggested trout, and much to the surprise of Jack we soon caught a dozen small fish. Like most Indians, Jack had a rather hazy notion about trout fishing in interior waters, since Lake Superior, filled with



Photograph by George Shiras, 3d

A MINNESOTA CONTRIBUTION TO THE SCENIC SHORES OF LAKE SUPERIOR

Minnesota, by reason of its climate, its woodlands and prairies, its countless beautiful lakes and connecting waters, has long been a paradise for wild life and a mecca for the sportsman and tourist. Owing to wise laws and a most efficient game commission, it stands in the forefront of progressive States. At some future time it is the purpose of this Magazine to portray at greater length the out-of-doors attractions of this commonwealth.

whitefish, lake and speckled trout, afforded such an ample and easily obtained supply by the use of the net, that the Indians rarely resorted to the rod.

After the meal the possibility of maple sugar led to a search, when Jack, suspecting what we were after, lifted a heavy, flat stone from the edge of the shelter, exposing a tin can filled with pulverized sugar, the treasure being thus concealed because Bruin had a sweet tooth and otherwise would soon have detected this little store.

A STRANGE NOISE FROM THE WILDERNESS

Toward evening a strange noise came from down the stream, a confusion of bawls and whimpers, which Jack announced as the family bickering of an old she-bear and cubs. Seizing the shotgun, I announced a preference for bears and suggested that we proceed accordingly. Jack grimly rolled up a shirt sleeve, exposing a shriveled arm, deeply scarred, which he said was the result of a fierce encounter with a bear ten years before, and since he was responsible for our welfare, the bear hunt was off on this particular occasion.

Not until many years afterward did I learn how uniformly harmless was the black bear, even with cubs, and that Jack's misadventure was due to falling on top of a big bear asleep between two logs, and in an endeavor to escape the animal had seized him by the arm under the very natural impression that any one taking such liberties should be repelled by force.

Little time was lost in starting the next morning along a blazed trail leading to higher ground, through which an occasional glimpse of Lake Superior could

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Photograph by George Shiras, 3d

YELLOW-BELLIED SAPSUCKER PUNCTURING A MOUNTAIN ASH

Many insects are attracted by the sweet fluid, furnishing food and a potion to the feathered proprietor.

be had an uncertain number of miles away.

In the final mile or so many deer runways were seen, all converging into larger ones leading toward the lake and each filled with fresh tracks of varying sizes.

Silence was suggested with a view to getting a shot, but Jack said that this was exactly what he was trying to avoid, as a deer killed away from camp meant delay and an unnecessary burden, and so he kept up a continuous chatter.

TYPE OF SHELTER THAT WAS OFTEN USED

At length a small clearing ahead indicated our goal, in the center of which appeared a type of shelter I had occasion to use in later years. It was shaped like a good-sized wall tent, having a narrow opening in the roof for the escape of smoke, with side walls of cedar logs extending up four feet and a double pitched roof of black ash bark.

There probably does not exist a more durable, waterproof, and easily prepared covering for a wilderness camp than black ash bark. The bark is removed from the trunks of the larger trees without difficulty in the spring, cut into sheets four by six feet, and put on, slightly overlapping. The sheets are supported beneath by cross-poles, while cedar strips along the outer surface prevent them from curling.

To one viewing the interior for the first time, the rich dark brown of the inner bark might be taken for a covering of well-tanned cowhides.

The birch bark in use for most Indian tepees along Lake Superior cannot be found in any virgin Michigan forests, for it is a second-growth tree in this region, as is generally the case elsewhere. Being inflammable and of a flimsy character, birch bark is not to be compared with the bark of the ash.

THE FIRST GLIMPSE OF WHITEFISH LAKE

On depositing our packs we were naturally eager to see the lake, lying concealed at the foot of the hill a few hundred yards away; but Jack declared the first thing in order was a meal, then the cutting of balsam boughs for the beds, ample firewood, and a general overhauling of the camp before the lake could be visited.

Finally all these preliminaries were over and we started down a steep slope for a body of water which, according to Jack, had been unvisited by any white man since the days of the Hudson Bay trappers, a hundred years before.

Interested as we were, could I then have anticipated what an all-controlling factor this little body of water was to play in the writer's destiny and that of his family, it would have been a much more memorable day.

A glance to the north disclosed a narrow lake about a mile long, heavily forested with pine and hemlock except at the end, where a semicircular growth of

reeds backed by cedars and black ash indicated an outlet stream.

A look to the south disclosed a beautiful slough between high hills, and at the end reeds, water lilies, and sand beaches, through which ran the inlet stream, showing a gorge filled, as far as vision reached, with stately elms, beneath which grew the ever-present alders.

The view on page 192 shows the slough looking toward the lake, which is somewhat obstructed by a point, and on page 134 is the valley down which Jack came when he discovered the lake.

THE CENTER OF THE DEER COUNTRY

In this little slough and the adjacent lands the time was to come when more deer would be killed by market hunters and sportsmen than in any tract very much larger on the American continent, and, what can be stated with more pleasure, it was in this locality that the new sport of hunting with the camera was to be originated, and where more deer were to be photographed by day and by night than elsewhere throughout their entire range.

This was the center of the deer country. Several natural salt licks were located beneath each bank, forming the central points of century-old gathering places of all the deer within a radius of ten or fifteen miles. Here, at any time between spring and early winter, they could be seen almost continuously.

At the time of our first visit none of us knew of this unusual attraction, for from where we stood it was impossible to see the animals close to the bank, and it was not until years later that the muddy and trampled surface and the sight of the deer gulping down this saline mixture indicated the presence of mineral springs, shown by analysis to contain a higher percentage of salt than many of the commercial salt wells in southern Michigan.

While we were intent on noting the surroundings, Jack pulled from beneath the alders what looked like a log, but when turned over proved to be a dugout made from white pine and containing a paddle and a gill-net.

Although made for only one person and used for trapping, we were all such light weights the boat was deemed large enough to carry two of us when hunting.

Jack soon made another paddle from a dry piece of cedar, and then, according to the rules of primogeniture, I was to go on the first hunt, the lower end of the lake being selected. Before starting, I asked why the slough, with its many runways, was not the best place to watch, and was told that this locality was reserved for fire-hunting that night, in case we had no success in getting one before dark.

Leaving my brother to find his way back to camp, we paddled slowly along the western shore toward the reeds and shallow waters, where Jack predicted it would take but a few minutes to get a deer.

Suddenly he whispered, "Put up your paddle. There is a deer ahead."

But I could neither see nor hear one. Passing some reeds bordering a little bay, I saw, standing within less than thirty yards, a small buck, intent on obtaining the succulent water grasses growing a few inches below the surface.

THE FIRST SHOT

Silently I raised the gun, aimed for the shoulder, and as the black smoke and heavy report evidenced the pulling of the trigger, the deer gave a spasmodic whirl, rushing toward the shore at an extraordinary speed, the water flying in all directions. Once more the gun was discharged, just as the animal, in a single leap, cleared the bushes and disappeared in the cedar brush beyond.

Reverberating echoes from the high ground across the lake did not conceal Jack's chuckle; but he gave assurance of another shot within an hour.

"Another shot!" What a mockery this seemed to one who felt sure that this time the effort had been successful; and, if not, what chance would there ever be of doing better? Therefore, with assumed confidence, I insisted that we would find the deer dead within a short distance. But Jack only laughed and steered the boat toward the opposite shore, for it was evidently his opinion that "buck fever" had given this animal a further lease of life.

After several hours had passed with-

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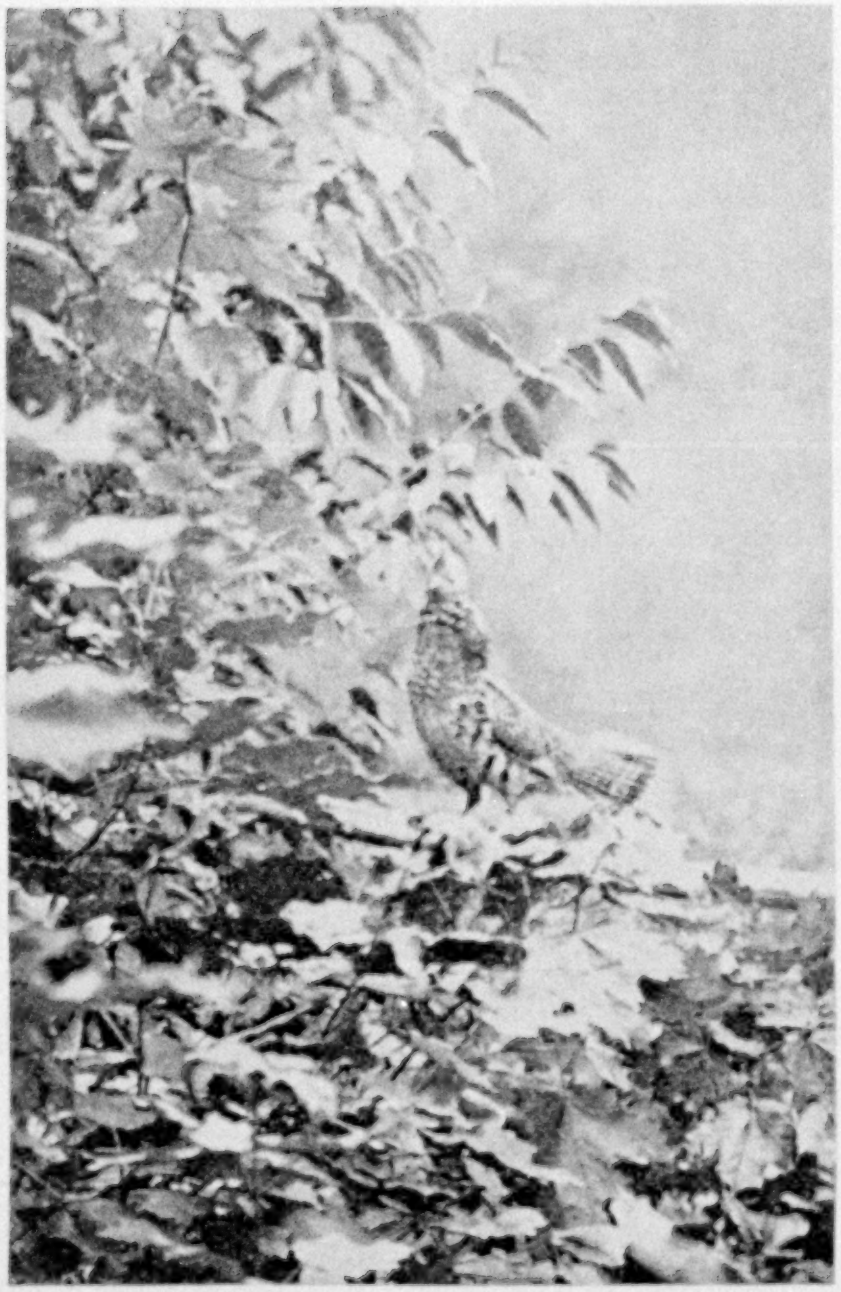

Photograph by George Shiras, 3d

AN ANCESTRAL RUFFED GROUSE

In the fall of 1892, on approaching the author's camp clearing, a cock grouse, clucking and spreading its tail on a branch beneath a wild cherry tree, was pictured with a small hand camera.

out our seeing anything further, we returned to camp, and, following supper, preparations were made for fire-hunting, under the primitive conditions employed by the Indians, it now being my brother's opportunity to provide the venison.

At dusk we went down the winding trail, illuminated by a flaming torch of birch bark from material brought in for this purpose. Placing an old frying-pan in the bow of the dugout, containing a handful of pine knots, with strips of bark near by, to be added when more light was needed, a start was made, and I returned to the camp, which was hardly reached before there came the crack of the gun.

THE AUTHOR'S BROTHER GETS HIS DEER

After a while the glare of the approaching torch showed Jack leading the way, carrying several pickerel taken from the net at the entrance of the slough, while my brother had the gun in one hand and in the other a stick upon which were impaled the heart and liver of the deer, showing the success of the hunt.

Then came the account of the dugout passing along the slough, when the sound of several deer trampling about in the mud led to the turning of the canoe in that direction, where two pairs of shining eyeballs indicated a choice of victims. When about fifty feet away the luminous eyeballs disappeared and the two animals could be seen looking across the water. Selecting the smaller of the two, it went down without a struggle, and at the landing it was soon dressed and hung up that it might be drained of blood.

During the night I resolved to arise at daybreak and, without disturbing the others, seek the place where my deer had gone ashore, with the vague hope of finding it or, if unsuccessful, to try for another animal single-handed.

THE QUARRY FOUND!

Never having paddled in the stern before, a few strokes were taken on one side and then on the other, and in this slow and clumsy fashion the bay was reached. Here the dried mud on the leaves gave the clue; so, pushing the bow of the boat into the bushes, I leaped clear of the muddy edge, seizing a projecting snag for support. But the snag proved to be the hind leg of my deer!

Sinking down, trembling with emotion, I eyed the crumpled body of the little

buck. Had a humanitarian witnessed the scene it might have looked like contrition over the destruction of a beautiful and innocent creature, but the time had not yet come when the camera was to be substituted for the gun in my big-game hunting.

After recovering somewhat, an examination showed that nine buckshot had passed entirely through the body, piercing both heart and lungs, thus giving an illustration of how far a deer will occasionally run when mortally wounded. But unknown then was the fact that most deer indicate by their actions the effect of a shot; for when missed they bound away gracefully, with the head erect and the white tail aloft, as though giving a farewell salute to the disappointed hunter, whereas on receiving a deadly wound they usually run rapidly instead of bounding, with the head lowered and the tail down, wringing it spasmodically from side to side. To the inexperienced hunter it is, therefore, of prime importance that he note carefully the action of the animal after a shot.

In dragging my deer through the bushes the stiffened limbs caught, and a heavier pull landed the hunter and the animal in the deep mud, making it a difficult task to get the bedraggled trophy aboard.

On nearing the end of the lake, my triumphant shouts aroused the sleepers, who hurried down the hill in the belief that the strangely absent member had gotten into some kind of trouble. But the sight of the dugout and its muddy occupants told the story of the clandestine and successful trip.

THE DEER MEAT WAS CAREFULLY CURED

During the day the meat of the two deer was partly dried in strips before a hardwood fire, and the day following this task was completed, so reducing the weight of the carcasses that all the edible portions were carried home—a lesson in conservation never lost. In later years I was to witness millions of pounds of meat left in the woods each fall by wasteful market hunters, who shipped out only the saddles, leaving the remainder to rot.

During the succeeding ten years, this trip was repeated often, being made each way in a single day, extra packers accompanying the hunters, so no meat would

GROUSE DOZING IN THE SUN

Crop filled with mountain-ash berries. A two-years' closed season, 1918-19, increased these birds beyond any previous numbers (see page 150).

Photographs by George Shiras, 3d

GROUSE IN MOUNTAIN-ASH TREE

On October 1, 1920, the opening day of the hunting season, several grouse were seen feeding on mountain-ash berries and their pictures were taken before a hunter appeared.

be wasted. Finally, in 1881, a railroad was constructed between Marquette and Sault Ste. Marie, passing half-way between Lake Superior and the camp, making it readily accessible (see pp. 188-9).

As I write, the fiftieth consecutive year has passed, during which longer and more frequent visits have been made, many of them recorded in subsequent pages. Seldom has a wilderness camp in this country retained its primitive attractions of forest and wild life so long. During this time many States, then unorganized in the West, have lost a large share of their once abundant game.

CHAPTER III

THE WHITE-TAIL DEER

The white-tail or Virginia deer has a wider distribution on the continent than any other antlered animal, and is likely to continue indefinitely, in many places increasing under suitable laws, aided by its wonderful capacity to adapt itself to changing conditions. It is the favorite big-game animal among sportsmen of America, for the meat is palatable, the antlers symmetrical and attractive, while its cunning becomes an additional incentive to those whose real enjoyment lies in the exercise of skill and persistence in hunting.

Animals like the moose and elk are seldom killed by sportsmen after one or two sets of antlers have been secured; for the great bulk of these animals, the difficulty in saving the meat in remote places, and the ease with which they are shot deters annual hunting, whereas the white-tail, much less in weight and usually within reach of transportation, is sometimes hunted by a sportsman for thirty or forty consecutive years.

While the writer has had an extended experience with various species of white-tails throughout most of the range of this group of deer, from Central America to near its northern limits, the present narrative is confined to those of the Lake Superior region.

The white-tail, while now quite abundant, was unknown on the north shore at the time the writer came to the region, in 1870. Moreover, there were few within a mile of the south shore, due largely to the ever-present Ojibways, so aptly called "Canoe Indians," who during the summer camped at the mouths of nearly all streams and other places apt to be frequented by deer.

DEER SPENT SUMMERS NEAR LAKE SUPERIOR

But when the country to the south began to be settled most of the deer spent the summers near Lake Superior, stopping first about the small interior lakes and headwaters of the numerous streams where the Indians seldom went before winter.

The writer's early visits to Whitefish Lake illustrated these conditions. The fact that approximately eighty thousand deer were killed each year of 1879, 1880, and 1881, and most of these within ten miles of Lake Superior, shows their extraordinary increase later. Since that time there has been a gradual and steady decline, largely on account of the great increase in hunters and the convenient method of reaching places previously inaccessible.

Every summer and fall, I spent a portion of each week at least with young companions camping on the south shore, traveling usually in a big, staunch rowboat, with a canoe often in tow. Trout fishing was of the best along the open waters, many of the fish being of great size. In the streams were brook trout, so often preferable for the frying-pan, while wild pigeons frequented the burnt-over clearings near the shore, unprotected by law at that time. Grouse were numerous in the same localities.

Whenever the camp was near a small lake, the canoe was carried over, and during the day a deer could generally be killed.

In the course of time all the well-wooded bays and sheltered points for more than a hundred and fifty miles were visited, including each lake and pond and every stream where fish or game abounded.

HEAVY GALES UNKNOWN ON LAKE SUPERIOR

In this long period only once or twice was the party windbound for more than a day and at no time in the slightest peril from wind or waves, showing that this, the greatest of all lakes, is peaceful and dependable beyond compare.

A FINE STRING OF SPECKLED TROUT

Catches such as the above were not unusual in Lake Superior prior to 1885. Average of above fish was 4½ pounds. Fishing in the mouths of all the spawning streams during the month of August accounts for the great decline in numbers (see page 155).

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Heavy gales can neither continue nor develop on Lake Superior, as shown by the fact that the maximum wind velocities seldom exceed 40 miles an hour. Not only is this remarkable record in striking contrast to the tornadoes of the Middle West and the hurricanes frequently reaching the Atlantic coast, but likewise in the case of many populous communities.

Here the Weather Bureau figures confirm the writer's conclusions. During a five-year period (1911-1915) the wind on 156 days reached or exceeded 40 miles per hour at Duluth, and in the same period a similar velocity was reached only 21 times at Houghton, 46 at Marquette, and 33 at Sault Ste. Marie, showing that the heavier winds subsided when they reached the lake, and that this vast area of water, instead of breeding gales or accelerating the land winds, had the opposite effect.

Moreover, the heaviest wind at Duluth in 47 years (1873-1920) was 78 miles per hour, in September, 1881, and this was very exceptional, while the highest velocity at this period for Houghton was 60 miles; Marquette, 62, and Sault Ste. Marie, 61—substantial proof that Lake Superior is free from heavy gales. Contrast such a record with the following stations, many of which cover a lesser period:

Mobile, Ala., 115; Buffalo, N. Y., 96; Mount Weather, Va., 110; Charleston, S. C., 96; New York, N. Y., 96; Fort Canby, Wash, 104; Hatteras, N. C., 105; Pensacola, Fla., 120; Key West, Fla., 115; St. Paul, Minn., 102; North Platte, Nebr., 96; Galveston, Texas, 94; Kitty Hawk, N. C., 100; Point Reyes, Calif., 120.

SHIPWRECKS ARE ALMOST UNKNOWN

However, when moderate winds prevail for several days along or across this vast body of water, one may see, under blue skies, great white-capped rollers dashing against the black volcanic rocks or surging high up on the beaches; but no reasonably staunch passenger steamer has ever been sunk on Lake Superior by reason of wind or waves, though occassionally some of the large freight carriers, when the shore and reefs are shrouded in a fall snow-storm, have been wrecked within the narrowing outlet of the lake; and again, on very rare occasions, an ore-boat, with decks awash, carrying an immense tonnage in its long, steel hull, has developed a structural weakness in a rolling sea and gone like a plummet to the bottom.

Loss of life in launches, sail-boats, or lighter craft has been negligible, and it is doubtless true that on many a small, interior lake or tidal bay there have been more casualties in a single season than during a century on Lake Superior.

MARKET HUNTERS KILLED 150 DEER A SEASON

Other trips were often made into the interior, where chains of lakes offered a change of scenery and of methods of hunting, including always a visit to a little camp near Whitefish Lake. The experiences gained in such widely separated parts of the region were later much enhanced when the camera allowed a longer and better opportunity for studying wild life.

The market hunters seldom killed less than a hundred and fifty deer a season. One hunter happened to locate his camp a few miles south of Whitefish Lake, where almost as regularly as the clock a horse in charge of an assistant passed each morning loaded with saddles of venison, to be shipped by express to Detroit or Chicago, while the remainder of the carcasses were left to rot.

This slaughter in the neighborhood continued for five seasons, with an estimated total of over four hundred deer to one gun. Then a ban was placed on the sale of venison and the killing fell off for a while.

When reference is made to the seasonal migration of wild creatures, we usually have in mind a large class of birds which every year go to and return from the breeding grounds in the north. Certain fish, like the salmon and shad, are migratory, as is the fur-seal and also some insects, including certain butterflies, but among the game mammals of our continent only the buffalo and caribou may be regarded as true migrants.

However, some species of the deer family, such as the elk and mule deer of the Rockies and the moose of Alaska, ascend regularly in the spring to higher

Photograph by George Shiras, 3d

TIMBER WOLVES POISONED ON WHITEFISH LAKE

Next to man, these animals are the most destructive foe of the white-tail deer in the upper lake region. Fourteen years ago, during a severe winter, when deep snows were crusted for several weeks, the wolves destroyed nearly all the deer within a ten-mile radius of Whitefish Lake. From the carcasses found it was estimated that over two thousand deer were killed in this limited area. A deer's fear of a wolf is only equalled by a wolf's fear of man (see pages 160-166).

grounds for better food or to escape insect pests, returning again when deep snows or killing frosts make the lowlands preferable.

But such movements, though well defined and participated in by hundreds and sometimes thousands of animals, are altitudinal and not latitudinal, and therefore not deemed migratory in the accepted sense, because they may travel to the north, east, or west in their ascent or descent each year, and this usually occurs when retreating or increasing snows regulate their movements.

With the true migrant the condition of the prevailing temperature, either in the spring or fall, has little to do with the migration, however much it was the original cause, for birds of many species travel at about the same periods each year, regardless of any then-compelling necessity.

DEER CHANGE THEIR MIGRATION HABITS

On the south shore of Lake Superior, including all of northern Michigan and Wisconsin, there once existed a spring and fall movement of the white-tail deer which possessed all the characteristics of a true migration. As this habit was abandoned more than thirty-five years ago, after continuing, doubtless, for centuries, it is worthy of record, especially in view of the fact that those who were

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Photograph by George Shiras, 3d

WHERE ANIMAL FLASHLIGHT PHOTOGRAPHY HAD ITS BIRTH: THE SLOUGH AT THE END OF WHITEFISH LAKE

In this small area more deer were killed, and later more photographed by day and by night, than in any similar locality on the continent. Natural salt licks were one of the attractions. This picture shows the method of taking daylight pictures by means of a string running from a seat in a tree to a camera on the beach. Whenever a deer was passing within range of the camera a sharp whistle stopped it, and then a pull on the string recorded the scene. A number of such pictures appeared in the NATIONAL GEOGRAPHIC MAGAZINE for July, 1906. The figure of a deer may be discerned in the background.

familiar with it are fast departing or have never understood the unusual character of this migration when compared with the habits of the white-tail in its other widely separated ranges.

Early in May, as soon as the depth of the snow permitted travel, thousands of does worked their way north, traveling alone into a broad belt along the south shore of Lake Superior, where a few weeks later the fawns were born. The bucks came more leisurely, but by early June the migration was over.

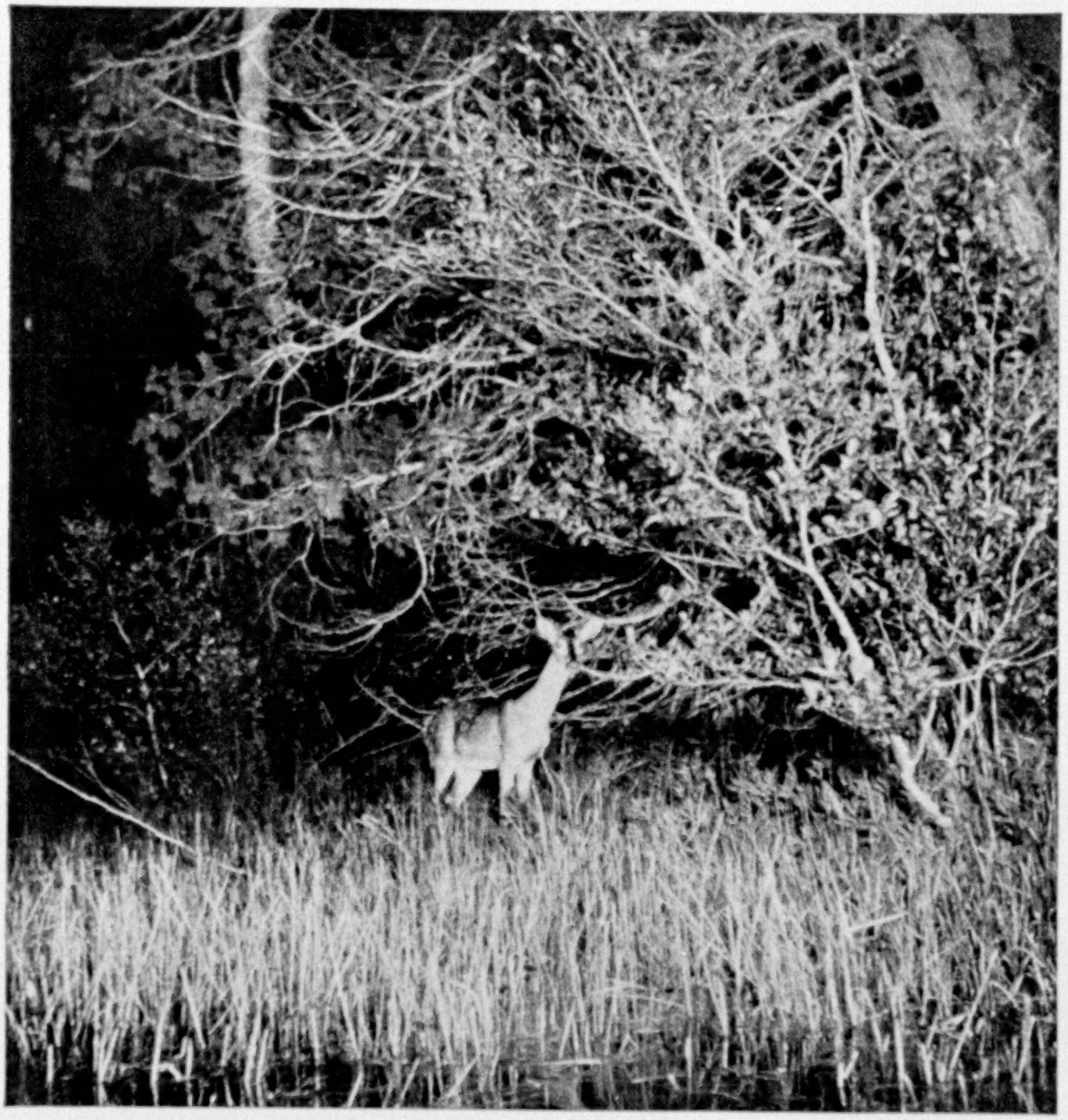
On the coming of the first heavy north winds, accompanied by a light frost, sometimes as early as August 15, the does, fawns, and yearlings started south, and by September thousands were on their way, regardless of the fact that no snow would fall for six weeks and none deep enough to interfere with the food supply or freedom of movement for more than three months later.

In October most of the bucks had gone, and I well remember my old guide, Jake Brown, who for many years wintered in the vicinity of my camp, telling me, on more than one occasion, that if he "didn't get his venison under the snow by Thanksgiving Day" he "would not have a chance again before the middle of May."

In a few instances it was known that deer yarded, trying to winter near the lake; but they were promptly killed, either by the wolves or the Indians.

SNOW MAY HAVE CAUSED ORIGINAL MIGRATION

Doubtless the great depth of snow in this region was the original cause of their fall migration, until it had finally become so fixed by inheritance that long before there was any apparent necessity the retirement took place. In twos and threes they traveled southerly on many trails



Photograph by George Shiras, 3d

THE FIRST SUCCESSFUL FLASHLIGHT OF A WILD ANIMAL EVER MADE

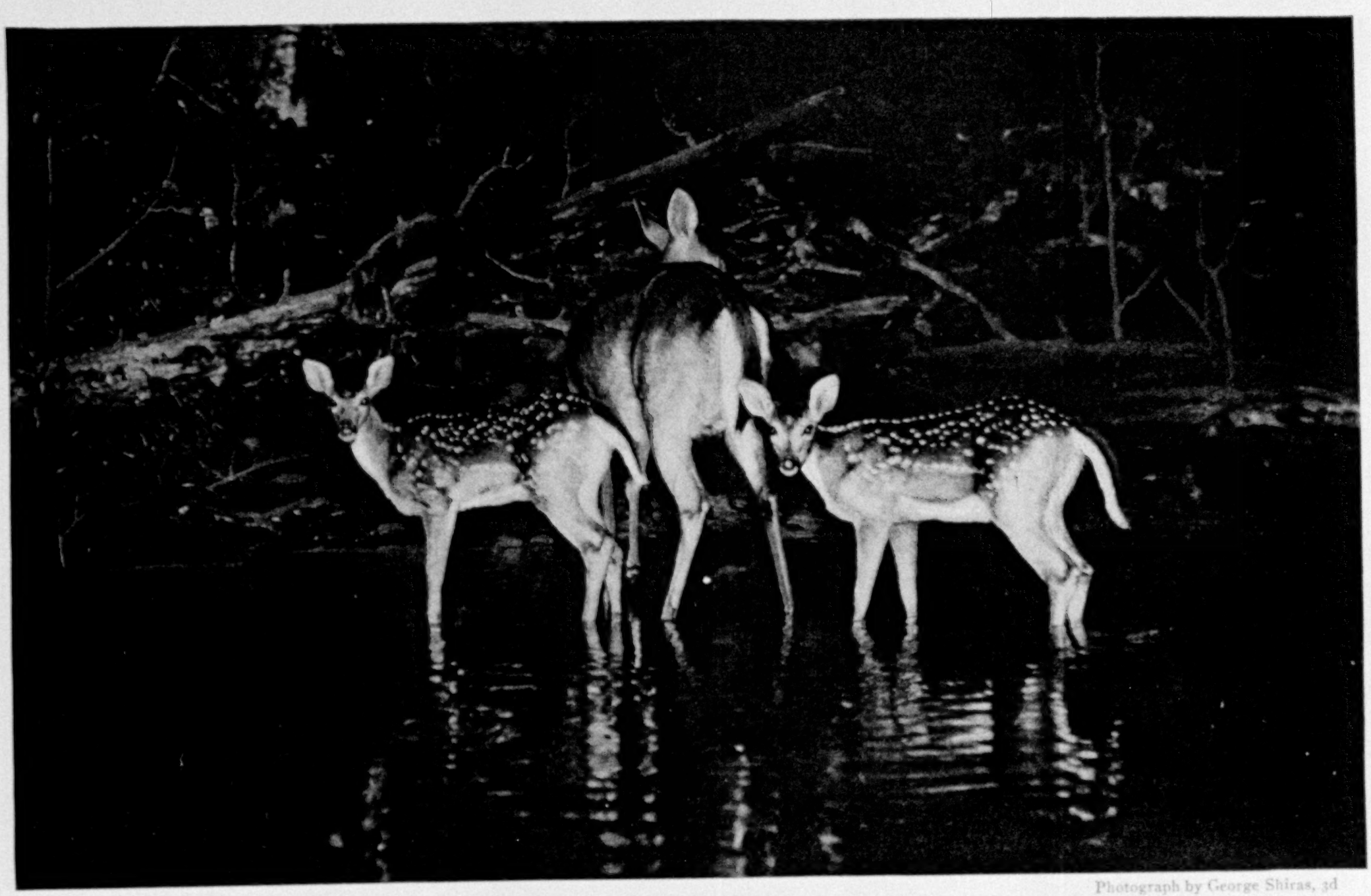
This yearling buck, with head erect and facing the jack-light, was the first satisfactory subject for a picture obtained by the author in his invention and development of night photography (see pages 175-176).

which by centuries of use had become about two feet broad, clear of obstructions and deeply cut in banks and soft ground. In swamps they were like caribou trails in Newfoundland.

These migrating deer always traveled with the wind and never against it, and always in the daytime, usually between 7 and 4 o'clock. It is interesting to note how this compared with the migration of the caribou in Newfoundland, where I spent two seasons studying it. There, too, the cows, calves, and yearlings began moving south about the 15th of August, but usually in bands of a dozen or more, followed by the large stags later, and, like the deer, they traveled in the daytime, but always against the wind except during severe weather, at the end of the season.

THE CARIBOU DEPENDS ON SCENT

It is characteristic of the caribou to depend upon scent rather than sight or hearing, and this is especially true of the Woodland caribou of Newfoundland, which,



Photograph by George Shiras, 3d

"INNOCENTS ABROAD"

A flashlight photograph of a doe and her twin fawns, taken from a canoe, on the eastern shore of Whitefish Lake, nearly thirty years ago. This picture, with the frontispiece and the two on pages 138-139, were the first to indicate the possibilities of the camera at night. The group mentioned was exhibited by the United States Government at the World's Fair, Paris, 1900, receiving the Gold Medal, and at the World's Fair, St. Louis, 1904, receiving the Grand Prize.

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migrating south in bands, have learned, through generations of experience in this oldest of English colonies, that danger always lies ahead; for concealed along the line of the trans-island railroad or in the passageways between numerous lakes are hundreds of hunters, mostly erstwhile fishermen, out for their winter's meat, with here and there an English or American sportsman in search of an antlered trophy. Headed against the wind and in a more or less open country, the telltale scent gives warning a long distance in advance.

On the other hand, the white-tail deer, traveling south alone or with the offspring of the year, moving steadily, but cautiously through a wooded country, always depend upon the eye or ear for any danger in front, and, coming down the wind along nearly straight runways, are able to scent any foe approaching from the rear, be it man or wolf.

DEER EASILY SHOT AT THE RAILROAD CROSSING

My first information concerning this migration came shortly after reaching Lake Superior. On several occasions one of my hunting companions spoke of the annual visits each fall of his father and several friends to certain localities on the Northwestern Railroad between Negaunee and Escanaba, some thirty miles south of the town, where the deer crossed the tracks in large numbers on the coming of the first cold north winds.

The members of this party were more interested in fly fishing, but found it possible to shoot all the deer they wanted in a few days each fall, since they presented easy shots on crossing the track and could be transported all the way back by rail.

In 1874 I was asked to join this party, leaving when the wind turned to the north, about the middle of August, for in those days the hunting season opened on or before this date.

The camp was located behind a sand-dune at a station called Helena, where there was nothing to dignify its name except a switch and a section-house half a mile farther east. At this point the railroad cut through a number of hardwood ridges, with open and nearly dry swamps between them.

Some of the deer followed large runways in the timber, crossing the track where there were deep cuts, and others came at a trot through the swamps, where often they could be seen at a considerable distance. The hunting was almost equally good for forty miles, most of these deer passing between Little Lake and Maple Ridge, coming from that portion of Lake Superior between Marquette and the Pictured Rocks, points indicated on the map (page 114). A similar migration occurred west of Marquette and throughout northern Wisconsin.

SAVING A QUARRY FROM THE TRAIN

On the first hunt I was placed on the south side of the track at a deep cut, where a deer had to come down one bank and up the other; so I was advised to wait until it was crossing the track, when I would have a better chance.

I had been concealed in the little brush blind about half an hour when, diagonally up the track, I saw a deer come out of the forest and stand on a bank cleared of brush. Remembering the instructions, I waited with considerable anxiety for it to advance. Just then could be heard the rumble of an approaching train bound west, with empty ore cars for the mines, and the deer, too, noticing the sound, evidently hesitated to advance.

After a minute's delay it seemed certain the animal would turn back, for the train was in sight, less than a quarter of a mile away. So, taking careful aim, I fired. The deer, giving a tremendous jump, toppled over the bank, lying with its head and shoulders across the track. Seeing it would take quick action to reach the animal before the train mutilated it, I hurried, arriving none too soon, for the heavy engine passed just as the deer was pulled aside, the engineer excitedly waving his cap by way of congratulation.

A SURPRISED HUNTER

On one of the fall camps at Helena the wind shifted to the south the afternoon of the second day, and any likelihood of deer crossing the track depended upon the return of the colder winds.

Toward evening we were visited by a miner of Irish extraction, who carried an ancient and rusty weapon of uncertain

Photograph by George Shiras, 3d

MIDNIGHT REFLECTION

A flashlight of a feeding doe, showing indifference to the jack-light after watching it for a few minutes.

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Photograph by George Shiras, 3d

A BIG SURPRISE FOR A LITTLE BUCK

This young animal fed toward the canoe, with its body partly concealed by the marsh vegetation; on raising its head at the edge of the reeds it was surprised to see the jack-light less than twelve feet away, and still more astonished when the flashlight exploded just in time to preserve the scene.

Photograph by George Shiras, 3d

THE FIRST FLASH, FOLLOWED A SECOND LATER BY ANOTHER, SHOWN ON OPPOSITE PAGE

caliber. He asked if he could borrow a headlight we had in camp, having been told by his companions that the only chance of getting a deer depended upon the use of such a light at night.

For nearly two miles along the railroad were deep ditches on either side, resulting from the removal of the earth for the road-bed when laid through the swamp. Throughout the summer these ditches were filled with many water plants liked by the deer. Both the local deer and those traveling south often came to the ditches after dark, where they could easily be shot by any one walking up and down the track with a headlight.

Having shot several deer before the wind changed and not caring for this method of hunting, except as a last resort, the light was prepared and the ambitious night hunter was instructed as to its use and told just how the shining eyes of a deer would look when reflecting the rays of the lantern.

Shortly after dark he started down the track. In the course of half an hour came a particularly heavy report, vindicating the aspirant's remark "that the gun was loaded with a handful of powder and another of slugs," and he "rather guessed it would lay out anything that came in the way."

After waiting several hours, we went to bed, wondering just what had happened.

A PET SLAIN IN THE SECTION-HOUSE

At daybreak the fly of the tent was jerked open, disclosing the bulky form of the section boss, who lived half a mile down the track. Thereupon he grimly asked, "Were you boys out under the light last night?" A unanimous and spontaneous response in the negative seemed to reassure him, for he remarked it was a fortunate thing, since the time had come when a graveyard should be started for fool hunters in this neighborhood.

Pressed for an explanation, he said that after his men had gone to bed, there came an explosion, sounding as if "Mogul No. 9 had busted her boilers." Investigation showed the entire lower sash of a window of the section-house had been blown to pieces, while in the middle of the floor lay Black Tom, their cat, in a mutilated condition, the slugs continuing their course into logs between the upper and lower bunks containing several peaceful sleepers.

On opening the door and looking out, they saw a headlight and some fellow hastily reloading his gun. Thereupon each had seized an axe or a crowbar and

Photograph by George Shiras, 3d

A DOUBLY-INTERRUPTED MEAL

These twin fawns, on finding a pile of cabbage leaves behind camp, considered themselves in rare luck, but as the head of one was lowered the thread running from the stick on the left to the tree on the right released the flashlight; then the flame of the powder burned a string, releasing a leaden weight connected by a string with another flashlight and camera, thus showing a peaceful scene during the first flash (see opposite page), and the efforts of the fawns to bound away in different directions just as the second flash exploded.

started toward their assailant, "using language common to those parts; but, hampered by bare feet, they were unable to overtake him, and when last seen he was headed in this direction, going strong."

"CHASED BY WILD INDIANS"

Without further explanation, we knew that our unfortunate visitor had seen the glowing eyes of the cat, as it sat on the window-sill, and at such distance the section-house could not be seen; so, very naturally, he fired, thinking the eyes were those of a deer. But what had become of him and our light was now the question.

Toward noon a stranger appeared, and, depositing the lantern by the tent, prepared to depart with only a bare greeting. This, however, did not suit our idea of the situation; so he was asked what had become of the man who borrowed the light. Thereupon he said that Pat had crawled into the tent during the night with a tale about "being chased up the track by a band of wild Indians brandishing tomahawks and spears," and if he "had not been a sprinter they would have gotten his scalp." Furthermore, he said he intended taking the first ore train in the morning for the mines. Before leaving, however, he told how he had fired at a big pair of green eyes, following which came a crash and a chorus of war-whoops, and he added that this was all the deer hunting he needed for the remainder of his days.

THE END OF THE MIGRATION

As the number of hunters increased along the railroad each fall, scaffolds were built a little way to the north on some of the approaching runways, thus cutting off those lying in wait at the track and leading to many controversies.

On one occasion, when still hunting along a trail, I found the remains of an Indian deer fence running for half a mile to the southwest, showing that years before the Ojibways of the Lake Michigan shore had taken advantage of this migration.

It has always been well known that deer will not jump even a low obstruction

Photograph by George Shiras, 3d

CAUGHT ON THE JUMP

This animated scene was obtained by the deer firing a blank cartridge first, and as they bounded away a released weight discharged the flashlight. Note that the fawn has not yet acquired the quickness and agility of the adult deer.

if placed in the general direction they are traveling. Such a brush fence, when crossing a number of runways, leads all the migrating animals to a point where the Indian hunter could kill them readily, or when absent a pit covered with brush precipitated the animal to the bottom, in some instances impaled on sharp stakes.

In 1885, some twelve years after my first experience in hunting the migrating deer, I made what proved unexpectedly to be a last visit. On arriving at one of the favorite crossing places, a barbed-wire fence was found strung for miles, south of the track, and post-holes were ready on the opposite side. It was apparent at once that this double barrier would soon terminate the annual migration, and a winter home must thereafter be found along the inhospitable shores of Lake Superior.

Before putting up the tent, I took a position on a high bank, from which place I saw a deer crossing the track some distance above. I wondered which direction it would take when intercepted by the fence. In a short while the unfortunate animal came ambling along, looking for an opening to the south, when a bullet ended its career. Feeling that such hunting was unfair, I gathered my outfit together and left on the next train.

Thus ended the deer migration of many centuries. Today all the great runways are obliterated by bushes and fallen trees; but, contrary to expectation, the deer soon adjusted themselves to their permanent home on and near the south shores of the lake. While sometimes in great peril when the snows are deep or crusted, they have, on the whole, a safer place than their former winter retreats in the south, where a largely increased population would soon have taken a greater toll than the timber-wolf or the lawless hunter of the north.

FACTS AND FALLACIES ABOUT THE WHITE-TAIL

There has always been a tendency on the part of some, when describing the white-tail, to illustrate the text with heads bearing an extraordinary number of points, whereas this animal, like the elk, is the only other member of the deer family having a growth of antlers remarkably uniform in size, shape, and number of points.

Any with thirty to forty tines or half that number are simply freaks and no more typical of the white-tail than one with three legs or two tails. Several million bucks have been killed in the United States, Canada, and Mexico in the past

seventy-five years, and most of those of unusual size or marked eccentricities in growth have been saved; so that it would be strange if in this large total there were not several dozen having an abnormal number of points or some unusual malformation.

The yearling buck is called a "spike horn"; the second year the antler has two points and is Y-shaped, and on the third, fourth, and sometimes the fifth there is an additional prong, representing with fair accuracy the earlier years. Thereafter there is no means of estimating the age except by the size and massiveness of the beam, which becomes uncertain when a deer passes beyond its prime, for then there is usually a recession in the size and weight of the antlers.

Photograph by George Shiras, 3d

A RUFFED GROUSE THAT TOOK ITS OWN PICTURE

At the edge of a clearing a bunch of mountain-ash berries was hung on a maple sapling, with a thread running to the camera shutter. A little later a female grouse pressed against the thread, with the resultant picture.

The maximum number of points vary from four to five, according to the range. In the south they are usually "four-pointers"; in the north and southwest the largest bucks average five points, which may be considered the standard in the respective localities.

PECULIAR GROWTH OF ANTLERS NOT DUE TO INJURY WHEN YOUNG

Sometime it has been suggested that a head having a great cluster of tines or other abnormalities has resulted from an external injury during early growth, but this, too, is erroneous, for with hardly an exception a peculiarity in one antler is duplicated in the other; and, moreover, these persist year after year in the same animal; consequently the internal growth is of symmetrical formation and in no-wise affected by external causes.

Another fallacy—in fact, a double one—is the belief of many that the variance often noticed in the color of the antlers is due to a stain when the velvet is supposedly rubbed off on saplings, those of resinous character staining one color and those with a different sap another color. Any such uniformity in results is impossible, and would only cause a temporary and limited discoloration.

But, what is more to the point, no member of the deer family removes the skin-covering, or so-called velvet, at the time or in the manner suggested, though occasionally a buck will use its forefeet for this purpose, or gently switch its antlers in the brush.

"HORNING" OF TREES A SEXUAL MANIFESTATION

The "horning" of a young tree evidences the beginning of the rutting season, being purely a sexual manifestation.

NORTH END OF GRAND ISLAND, THE WESTERLY TERMINUS OF THE PICTURED ROCKS

It was over this precipice the imported Newfoundland caribou were supposed to have met their fate when chased by a timber wolf (see page 181). Note the human figures at the base of the cliff.

These trees are rubbed fully a month after the velvet has been shed, and some weeks before the does are responsive, or about October 15, in the Lake Superior district.

In the past ten years I have been in the Michigan forest during all that month, my notes showing that the first rubbed sapling was October 5, and in the nine other years the date averaged the middle of that month.

In rubbing the antlers on a sapling, the white-tail lowers the head until the nose comes within a couple of inches of the ground, and then, in a deliberate way, one beam is pressed against the tree, the friction removing the outer strip of bark for about sixteen inches, showing the fresh white streak of the inner wood. The tree, small as it is, is seldom girdled, indicating that the animal stands in one position.

CARIBOU AND ELK ATTACK TREES AS IMAGINARY RIVALS

The caribou and elk, however, often regard the tree as an imaginary rival, attacking it with considerable vigor. Once I saw a bull elk butt a lower branch of a heavy red cedar, and as the limb rebounded the animal received a stinging blow in the face; whereupon he charged with the full weight of the body, snapping off the limb with a report heard 200 yards away.

The does bear their fawns on the higher ground, between May 25 and June 25, or seven months after the rut, concealing their young in balsam or maple thickets, where the family group lingers until fall, being more open to attack by the illegal hunter than the bucks, who hide in the thick and almost impenetrable swamps.

On the coming of the heavier frosts, in early October, the bucks wander about in the night, rubbing the trees and pawing up the ground some weeks in advance of the mating season, which occurs between October 20 and November 20, shortly after which the antlers are discarded, usually between December 1 and January 15.

Contrary to general belief, the antlers are not for use in defense against predatory animals, like the wolf, for they are shed before the coming of the deep snows and when open waters still offer an effective means of baffling pursuers. When chased thereafter a buck will make his final stand by facing the foe, rearing high and coming down with the sharp forefeet on any animal attacking from the front.

ANTLERS USED IN MOCK BATTLES

The antlers are, therefore, purely a sexual manifestation, being used freely in mock battles with a rival. These sometimes develop into a serious affray, and then death may come when the antlers are inextricably interlocked.

The larger bucks weigh between 200 and 300 pounds, and it has long appeared to me that those of upper Michigan, either by gradual evolution or survivorship, possess much longer limbs than any of the species elsewhere. Living permanently in a region of deeper snows, it would seem that the ones having the longest legs would get a better footing or be able more easily to leap over logs or windfalls when being driven by the timber-wolf.

On the other hand, the deer of the lower Alleghany Mountains in the State of West Virginia seem to have unusually short legs, for in this region their only safe retreat from hounds or man are the dense laurel thickets, where many of the runways pass under gnarled limbs only a foot or two above the ground, so that the ones more likely to escape pursuit are those capable of entering the first thicket or passing from one to another.

HOW THE MICHIGAN LICENSE SYSTEM NEARLY EXTERMINATED THE DEER

As a step toward conserving the deer, the number that could be killed annually in 1895 was restricted in Michigan to five for each hunter, and the license bore five detachable coupons for use in tagging each carcass. In the opinion of all sportsmen, this new system was expected to be of the greatest future value.

Then occurred an extraordinary psychological influence, upsetting all calculations, and Marquette County well illustrated what happened throughout the Upper Peninsula. Heretofore about three hundred persons hunted deer annually in this county. When the first licenses were issued, the usual number

XUM

that had hunted previously applied for permits, but it was noticed these applications kept on increasing throughout the season, until they totaled 652, far exceeding any previous year.

From this it appeared the public got the idea the State had awarded each of its citizens five deer a year at a nominal cost for those thrifty enough to act.

NUMBER OF HUNTERS INCREASED BY LICENSE SYSTEM

The following season other influences directly traceable to the license system not only increased the number of hunters, but, to a disproportionate extent, the number of deer killed; for it was observed that persons who theretofore were content with a single deer, or when disappointed on a hunt gave up at once in disgust, now tried to kill their legal limit, going to the woods again and again in this endeavor, and were not above having others supply the missing number if unsuccessful.

This situation was further influenced by the newspapers containing many personal items to the effect that "John Doe has filled his license during the first week," or that "Richard Roe expects to do so on the next hunt," and other suggestive statements, making each licensee feel he was on trial as a sportsman and a possible subject of ridicule when returning empty handed. Moreover, the licenses, with their strips of coupons, were conspicuously displayed in factories, shops, and offices or on the street corners, until hundreds who never had the slightest idea of hunting deer joined the crowds on their way to the county clerk's office.

An examination of the following figures ought to prove of interest, especially in view of the fact that there was no increase of population in this county, but actually a small decline during the period indicated.

MARQUETTE COUNTY DEER LICENSES

Year.	Licenses issued.
1894....(estimated)	300
1895	640
1896	813
1897	853
1898	950
1899	1,047
1900	1,306
1901	1,532
1902	1,749
1903	1,942
1904	2,060
1919	3,379

This extraordinary increase from about 300 before licenses were issued to more than 3,300 hunters in a single county seems to have no other explanation than the one given. The system has brought about the destruction in the State of more than two hundred thousand deer that would otherwise have escaped and has continued indefinitely a well-organized band of hunters.

However, the license system in vogue throughout the most of the country has been of greatest value, supplying each State with ample funds for preserving the game and in many other respects proving of inestimable service. It just so happened to have had the opposite effect with Michigan's one big-game animal.

TEN DOES WILL HAVE 1,510 DESCENDANTS IN TEN YEARS

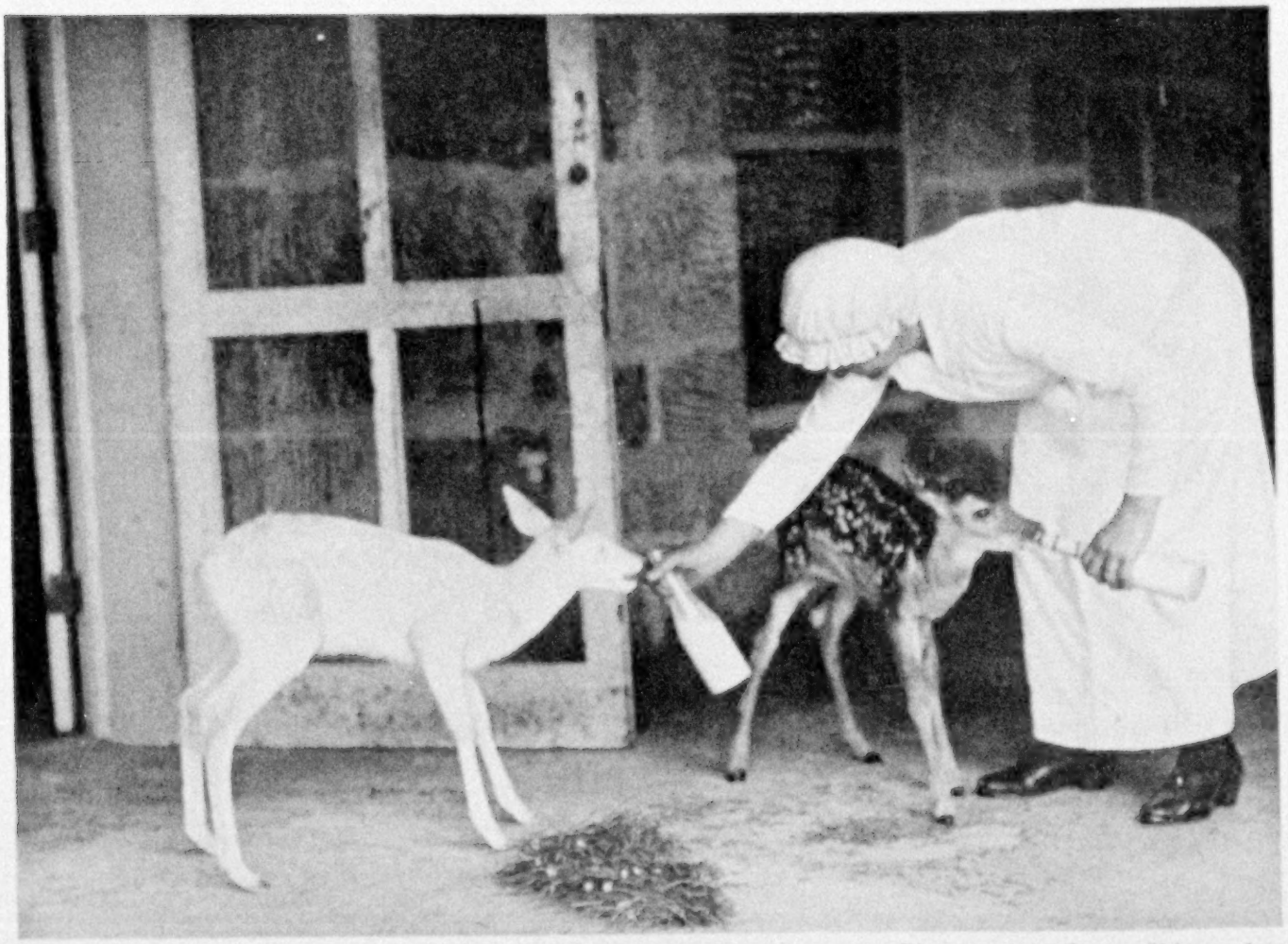
The white-tail is the one big-game animal whose perpetuation means more to the sportsmen of the entire country than any other animal.

The first and foremost necessity is a buck law to protect the females and fawns in every State containing any antlered animal.* Just let it be understood that when a buck is shot the number for the following year is lessened by only one, whereas he who kills a young doe destroys, by a single shot, potentially 151 bucks and 151 does! For it has been shown, upon a strictly scientific basis and by an accurate mathematical calculation, that a doe and her descendants in a period of ten years, not counting out the natural casualties, will produce a total of 302 deer, and by the death of this ancestral mother the link is broken, with the irrevocable loss stated.

The same proportion holds true with a larger number, for ten does and their descendants will produce 1,510 bucks and 1,510 does, showing that when the female is protected more deer can be killed each year, beside leaving an increased number in the woods.

Such a result is not, after all, so mys-

*Twenty States have passed this law.



Photograph by George Shiras, 3d

WHITE FAWN FOUND IN 1916, WHEN A DAY OR TWO OLD

Reared in company with the red fawn. The usual row of white spots can be seen on the white body (see page 183).

terious, if we keep in mind the methods of reproduction applicable to domestic animals; for if a farmer had as many bulls as cows, as many roosters as hens, and killed them indiscriminately of sex, he would, of course, be classed as demented.

Just because our wild animals bear their young in remote thickets, we seem to think their maintenance is based upon a different method, and go on killing the females year in and out under the blind assumption that it can make no particular difference in the future supply, whereas it represents the difference between extinction and perpetuation.

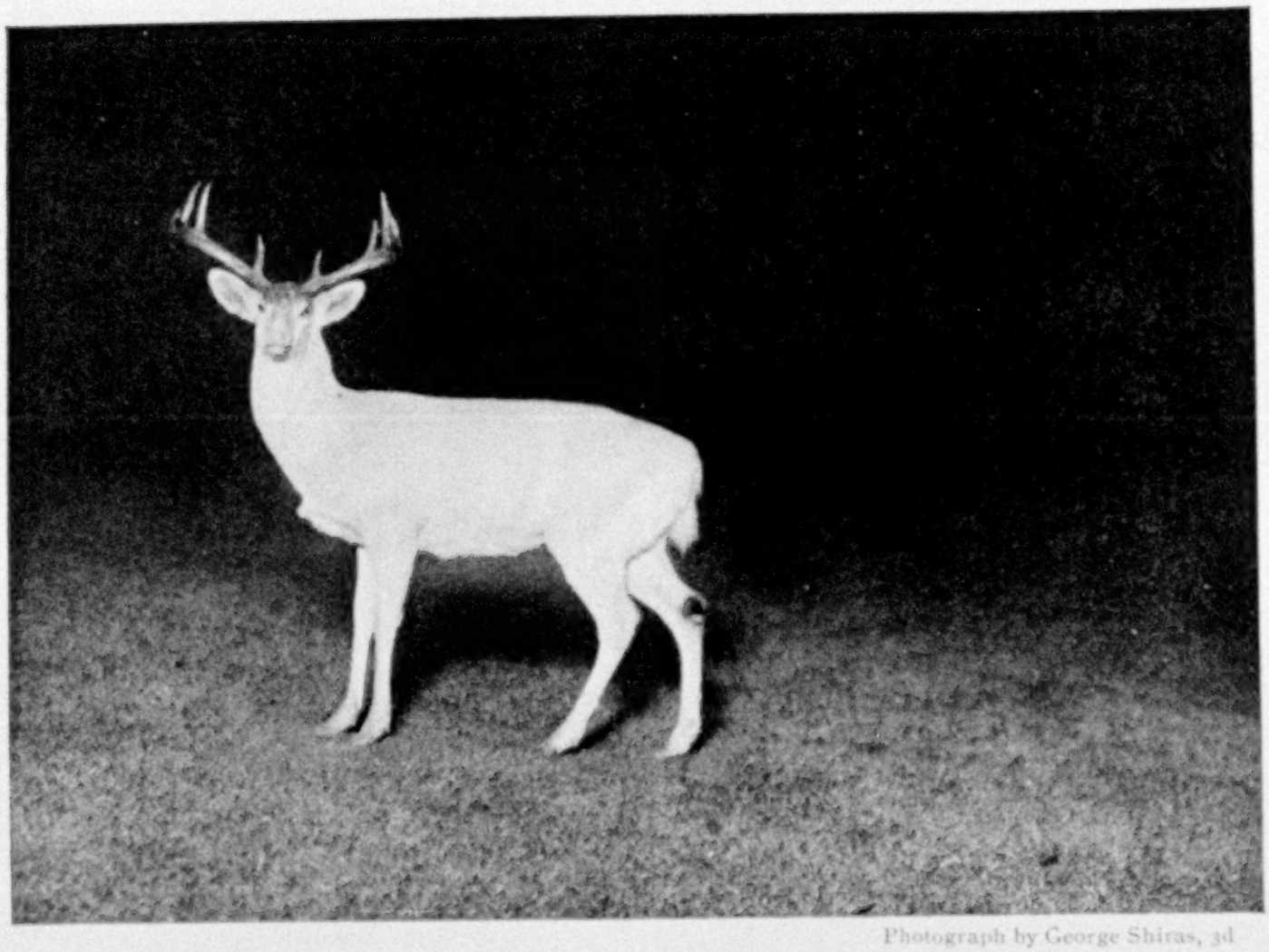
In my boyhood days it is doubtful if there were a thousand deer in the wilder portions of Pennsylvania. Last year 3,000 bucks were killed in that State, and this number will increase steadily, the only limitation being a sufficient area to sustain such a multiplication of the species. But in this State, like New York and Vermont, the second growth in rough and mountainous portions has been restocked with game and properly safeguarded, showing how the older localities have already taken advantage of the favorable change in environment (see page 204).

CHAPTER IV

THE SUDDEN DISAPPEARANCE OF THE PASSENGER PIGEON IS THE GREATEST OF ALL BIRD MYSTERIES

The final stand of the passenger pigeon was made in northern Michigan, Wisconsin, and western Ontario, and in this general locality I witnessed the demise of a once countless species. Gradually the flocks had been driven from their haunts in the Atlantic coast states and about the Ohio Valley, but from the time I first went to Lake Superior to the date of their sudden disappearance, the wild pigeon seemed to be present each season in its usual abundance.

For a species that far exceeded any other game bird, a gradual decrease



Photograph by George Shiras, 3d

THE ANCESTOR OF THE ALBINO DEER HERD OF GRAND ISLAND

Observed first in 1912; killed by a pot-hunter in 1914, when about seven years of age. Body mounted as above. Spread of antlers, 2 feet 2 inches; weight, 150 pounds. It has had nine white descendants so far (see page 182).

might be attributed to several reasons apart from the various and continuous methods of destruction, namely: the range was always east of the Great Plains, thereby permitting concentrated hunting in the more accessible regions. Furthermore, each pair had but one young, in contrast to the domestic pigeon, with double the number. However, their unexpected and inexplicable extinction in, perhaps, a single season constitutes the greatest of all ornithological mysteries.

The birds came in vast flocks to Lake Superior in May, and before colonizing for nesting they were killed by natives, who fired into the passing flocks as they swept low along the shores, this being the only period when wing-shooting was indulged in.

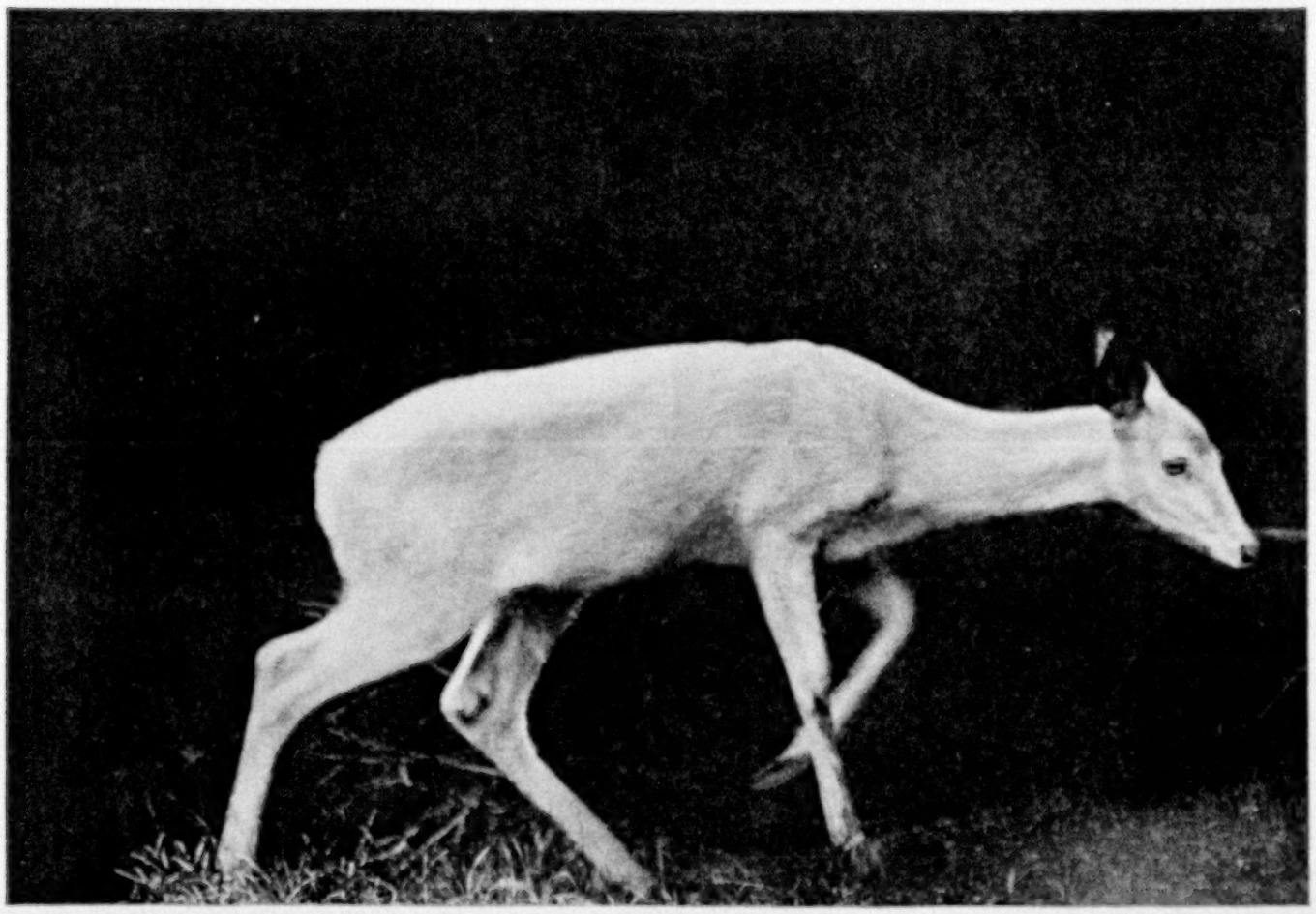
After the birds had selected a breeeding place, usually in the same locality each year, the slaughter began; for, besides the local hunters, the professional trappers were quickly notified of any gathering place, and were soon on hand netting or killing these birds by the thousands for the eastern market, besides shipping them alive in crates for trap-shooting tournaments.

BIRDS SLAUGHTERED BY FIRELIGHT

I never attended any of the holocausts at the breeding places, for such they often were, since circular fires were built around the roosts after all the birds had assembled for the night, and in the confusion of the smoke and flames they were beaten down and destroyed in the most relentless manner.

About the middle of July the survivors, with their young, dispersed over much of the surrounding country, gathering particularly about huckleberry plains and burnt-over districts, where ground food—huckleberries, alder-berries, wild cherries, and service-berries—were abundant.

After the wild fruits were gone many



Photograph by George Shiras, 3d

FIRST ALBINO FAWN, AT THE AGE OF THREE YEARS, IN ITS SUMMER COAT, WHEN THE PINK SKIN SHOWS PLAINLY THROUGH THE THIN, WHITE HAIR (SEE P. 185)

flocks moved into Canada, where a later berry season was the attraction, and by October all departed for the south, unless a heavy crop of beechnuts led some to linger.

It was in August, 1885, that I made the usual trip to some large plains covered with huckleberries, ten miles up the shore from Marquette and inland about a mile, where it was my custom to kill, once a year, a large number of pigeons for distribution among friends. Such an expedition differs from the ones where shooting was limited to a few for camp use.

Selecting the young, so readily told by the immature plumage, it took only a few hours to accomplish my quest. At this time the birds were in their usual numbers, and I returned under the belief the wild pigeon would continue for many years in this region.

BIRDS SUDDENLY VANISH

The next season I saw a single bird; but, like the rest of the hunters, concluded that for some unforeseen reason the pigeons had gone elsewhere and would surely return the following year. But not one, to my knowledge, has been seen since along the Lake Superior shores.

When the unfortunate history of this bird is examined, it is not hard to see that it was doomed because it was a migrant. The rule in each State was to have an open season when such migrants were present and a closed season, if any, after they had gone. This meant, of course, continuous shooting throughout the year.

In 1857 the Ohio legislature enacted a law protecting local game birds, and the committee report gave as a reason for not including the wild pigeon the following:

> The passenger pigeon needs no protection. Wonderfully prolific, having the vast forests of the north as its breeding grounds, traveling hundreds of miles in search of food, it is here today and elsewhere tomorrow, and no ordinary destruction can lessen them or be missed from the myriads that are yearly produced.

The fact that migrant game birds, above all others, needed protection was not seen at that time, and not until long afterward, when the passage of the Federal migratory bird law made possible an

Photograph by George Shiras, 3d

SECOND WHITE FAWN AND THE NORMALLY COLORED MOTHER

Both are wild and unapproachable (see page 183).

adjustment of the open seasons throughout the country consistent with the protection of this class of birds.*

An epidemic or some convulsion of the elements, such as an offshore gale, with the clouds raining down heavy hailstones, may have accounted for their sudden disappearance, but from information available one can only guess as to the immediate cause which brought about their untimely end.

RUFFED GROUSE MOST HIGHLY ESTEEMED OF UPLAND BIRDS

The most highly esteemed game bird of the northern uplands, whether for sport or the table, is the ruffed grouse. Clothed in rich gradations of brown or gray, the neck encircled by a ruff of iridescent black, erect in figure, with a sweeping fan-like tail, its presence is often disclosed by a sudden whirr and a meteoric flight, startling even to the expectant hunter or the trailing fox.

With the extinction of the passenger pigeon, once so numerous about Lake Superior, and the rarity with which shore birds or wild fowl venture across broad waters with unsighted shores, the perpetuation of the ruffed grouse as the sole resident game bird of the region becomes unusually important.

On my first camping trips the grouse were found in many clearings, second-growth thickets, and about old lumber roads; for berries, insects, seeds, and sunlight induced such gatherings. For years I was under the impression that this bird was well distributed and numerous. Later I found that in the main forests and in localities where water was distant more than a quarter of a mile scarcely a grouse could be seen, except when midwinter drove them into the heavier timber.

After the local hunters increased tenfold and the automobile gave access to the more remote places, the grouse of upper Michigan declined to a point where extinction was imminent and appeared certain when two cold, wet springs occurred and hardly a young bird survived.

A REMARKABLE INCREASE IN BIRDS

In 1917 the legislature closed the season for two years, and the result exceeded all expectations. The ensuing year showed a great many scattered coveys, and the next they more than doubled, while in the spring and summer preceding the open season the birds were found in numbers never known before in the history of the country, automobiles being stopped frequently by birds dusting themselves in the woodland roads.

With a daily limit of five birds and a total of 25 for the season, one might have supposed that the number killed would hardly have equaled the best years of the earlier days. But they were brought in the first day by the hundreds, by thousands the next week, and then by tens of thousands, exceeding a total of one hundred thousand in the shortest season.

* Mr. Shiras has refrained from stating that in 1904, when a member of Congress, he was the author of the original migratory bird bill, the later enactment of which has insured not only the perpetuation of our wild fowl and insectivorous birds, but has already led to a greatly increased number. This measure is generally regarded as the most important game legislation that has been passed by State or nation.—EDITOR.

In Minnesota in 1920, under a similar closed season, but with larger bag limits, the kill was unparalleled, with a total exceeding 500,000 grouse.

Photograph by George Shiras, 3d

SAME WHITE FAWN AND COMPANION IN FALL, WHEN EACH HAS LOST THE WHITE SPOTS (SEE PAGE 183)

THE GROUSE THRIVED IN CLEARINGS

Many might naturally think that this wonderful increase was wholly due to the previous closed seasons. While undoubtedly making such a showing possible, in the writer's opinion the result was primarily due to another distinct and, fortunately, permanent cause, namely, a gradual and favorable change in environment during some thirty years preceding.

By reason of overshooting and unfavorable weather, the grouse of Michigan, Wisconsin, Minnesota, and western Ontario had been greatly reduced, only a scattered bird being found here and there. With a two years' closed season the remnant had an opportunity to establish itself in the thousands of clearings where few birds had ever had a chance before. The fact that one pair and their offspring would produce some 200 birds during the period they were thus protected indicates how the grouse was able to spread quickly through the entire region.

BIRDS NOW SHOT ON THE WING

The daily limit of five birds has resulted in a new form of sport in northern Michigan. Accustomed in this region to killing the grouse on the ground or in the trees, the hunters soon found the limit of five birds might be reached shortly after discovering a well-filled covey, and the day's sport ended in a moment. Therefore, for the first time, many began shooting on the wing, using thousands of shells without much damage to the fleeing birds, but greatly expanding the day's sport.

"A dead bird tells no tales," but the many survivors of this aërial bombardment have received a greater education regarding the use of gun than any of their predecessors, many finally acquiring the alertness and caution of the grouse of the Eastern coverts.

PECULIAR HABITS OF THE GROUSE

In the temperate months the grouse has an excellent choice of food, consisting of a great variety of berries, small fruit, seeds, buds, clover, beechnuts, grasshoppers, and a multitude of young, tender leaves. In the winter one wonders at their survival; for now the fall flight of the robins completely exhausts the berries, which were wont to linger and ripen well into winter, compelling the grouse to depend largely upon yellow birch buds, with many a forced meal on an evergreen.

Fortunately, whenever the temperature is far below zero the sky is usually clear and the grouse are active and unconcerned, but if the days and nights are dark and cold or the air filled with merciless pellets, they have the habit of plunging from a higher branch head foremost into deep snowdrifts, where a foot below the surface the heat and weight of the body form a globular retreat, in which they remain comfortably until the storm clears or hunger forces an exit.

Once when seated in a tree watching for deer, several days after the conclusion

Photograph by George Shiras, 3d

SECOND ALBINO BUCK, CAPTURED IN 1915, WHEN THREE YEARS OLD; WEIGHT, 160 POUNDS

Shown above with three normal deer and fawn. Antlers each year in the form of long spikes, with one forked. Note white velvet on the growing antlers (see page 185).

of a heavy snowstorm, I saw what looked like a small mouse at the base of a maple tree, and then this dark object elongated into the head and neck of a grouse. Finding the weather to its taste, it emerged, clucking and spreading its tail before taking flight for a repast upon the swollen buds of a near-by birch.

Many years later, while hunting the varying hare, just as a blizzard came sweeping in from Lake Superior, I saw the swift descent of a dark body from a tree ahead and a slight disturbance in the snow. Noticing a grouse in the same tree, I knew its companion had sought warmth and protection in the coverlet below and I withdrew without disturbing either.

Sometimes in winter or the early spring there may come a rain or a warm day that melts the surface snow, followed by severe weather, and then thousands of grouse are imprisoned and the heretofore safe retreat becomes their tomb, should weeks pass by before the seal is broken.

CHAPTER V

EXTRAORDINARY CATCH OF LAKE TROUT WITH TROLLING LINES

In 1872, when 12 years old, I had an early introduction to lake trout. A report was brought to Marquette by a lumber-laden schooner, becalmed for a while in the vicinity of Stannards Rock, a sandstone reef lying a few feet below the surface, some forty-five miles northwest of the town, that the waters about the reef were surrounded by immense schools of lake trout. It was said that the fish could be hauled aboard the schooner by simply casting a trolling spoon overboard, when there was such a rush by the fish that one could imagine it was a contest to see which one might be caught first.

An enterprising captain of a local ex-

Photograph by George Shiras, 3d

WHITE BUCK WITH A MIXED HAREM OF WHITE AND RED DOES

This buck never recovered from the shock of its capture, remaining wild and lame (see page 182).

cursion steamer thereupon advertised an expedition to this vicinity, and about seventy-five persons, including women and children, departed under bright skies and unruffled waters. At noon the dangerous reef was approached cautiously, and the steamer anchored in about thirty feet of water.

Soon ten boats were lowered over the side, each expectant fisherman having a trolling line, as many as four or five lines trailing behind each boat. In a few minutes there was a rush of eager fish, and to my youthful mind there never were such scenes of excitement, for as the boats circled about the reef the long lines were diverted at various angles by the larger fish, becoming entangled, while the continued flopping of those captured caused the women and children to shriek in triumph or dismay.

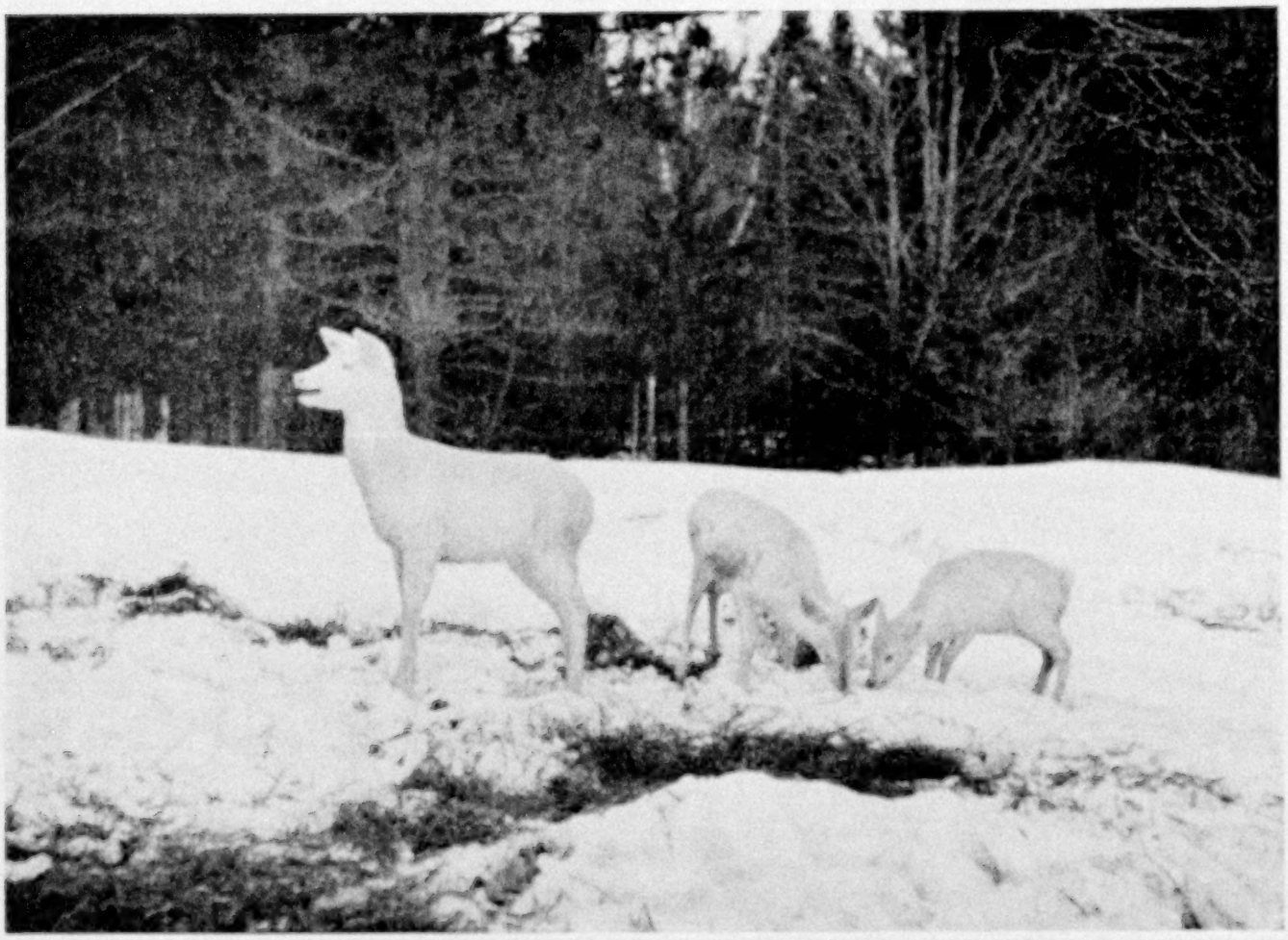
Several times I had on a fish weighing over twenty-five pounds, which only with the aid of stronger arms could be lifted free of the water. In one instance a spoon that became detached was cast overboard and a near-by fish bolted it and went off in triumph! In several cases tin-tipped oar-blades were seized, so anxious were the fish to try anything having a resemblance to living prey.

In less than three hours a thousand fish were taken, averaging ten pounds, and then this riot of destruction came to an end, for it finally became apparent how difficult it would be to give away five tons of trout among the friends and neighbors of the participants.

The results of this expedition soon reached the ears of the local fishermen, and for several succeeding seasons immense catches were made. Now a towering lighthouse surmounts this rock as a warning to the mariner and a fitting monument to the myriad of fish that have long since passed away.

AN IMPROVISED COOKING OUTFIT

On one of my earliest camping trips for speckled trout, with old Jack as guide, we rowed about three miles when it was discovered that the box containing the



Photograph by George Shiras, 3d

A PIG-LIKE ALBINO BUCK AND TWO WHITE FAWNS: GRAND ISLAND (SEE PAGE 182)

cooking outfit had been left behind. Naturally, I suggested returning for it; but Jack promptly said it would bring bad luck to do this after once having made the start, and, besides, with our pocket-knives it was easy to make what was needed.

In about three hours Shot Point was reached, the first rocks to the east, where I began fishing, leaving Jack to put up the tent and start the fire.

MAKING A FRYING PAN FROM A CAN

On returning with a creel of trout, I found Jack had already replaced the missing outfit. From large sheets of birch bark he had fashioned plates, while cups and other containers were made of the same material, with knives from hardwood and forks of double-jointed twigs. In the fire was a can of tomatoes perforated in the top to let out the steam, while well beneath the glowing coals half a dozen potatoes were baking. Alongside he placed the dressed trout, wrapped in wet, brown paper. Then the tomato can was emptied into a birch-bark dish before the fire, and with a piece of wire a bail was made for it, and soon the tea was boiling.

At the next meal, after heating a can of beans and removing the contents, it was cut and flattened into a frying-pan, with a handle made of a split stick, serving thereafter for frying trout or bacon and the all-important flapjacks.

On suggesting to Jack that several of these fireside conveniences depended upon having canned goods, he thereupon picked up a small boulder and explained that, after heating several of these in the coals, by putting them into the birch-bark bowl one could brew tea, make soup, boil fish, or have a stew.

This was my first lesson in the ease with which supposed essentials might be left behind, proving a useful experience when forced to travel light, or a capsize of the canoe sent the outfit to the bottom.

THE SPECKLED TROUT OF LAKE SUPERIOR

Prior to 1800 the range of the speckled trout included all of the shore waters for more than a thousand miles, except in places where sand beaches lacked coarse gravel or boulders, or continuous cliffs

made the steady surge of the receding waves an unsuitable location for a fish particularly disliking turbid or unsheltered waters.

Every tributary stream contained trout as the permanent and almost sole occupants, with the temporary addition of all in the lake during the spawning season, unless flowing from headwater lakes, in which case the higher temperature and the existence of pickerel or bass discouraged their presence.

Consequently, good fishing was within easy reach of every settlement and camping place, the trout occupying a narrow strip within 50 feet of the shore or nearby islets and reefs, for beyond were the giant lake trout, which, while respecting absolutely the riparian rights of their more aristocratic kin, allowed no trespass in their own domain.

On the other hand, just to the east, Lake Huron, including Georgian Bay and the southern portion of Ontario, contained no speckled trout except in an isolated case or two, for bass, pickerel, pike, and land-locked salmon abounded, the less abrupt watersheds favoring chains of lakes with sluggish, interconnecting streams of a high temperature in summer.

Photograph by George Shiras, 3d

ALBINO DOE IN HEAVY WINTER COAT

She was brought from southern Michigan in 1918; eyes pink and very susceptible to light; hoofs and nostrils white (see page 183).

A TROUT FISHER OF 70 YEARS AGO

In 1849 the paternal grandfather of the writer first came to Lake Superior, intent solely on trout fishing, having heard from pioneer business friends of the beauty and healthfulness of the region and the wonderful trout fishing. At the time of his earlier visits it was necessary to transfer around the Sault rapids, taking a small steamer that had been assembled beyond, when visiting any of the few settlements on Lake Superior.

To one who had fished only the brook trout of the Alleghany Mountains, the size, brilliancy, and activity of those in the lake were in striking contrast, and in the long period following he seldom visited any stream, for the smaller fish and their ease of capture did not appeal to him.

Accustomed to making his own bamboo rods, flies, dip-nets, or seines for catching minnows, he either fished from a little rowboat, anchored in a suitable location, or from some of the many points separating bays, where there was a steady movement of the larger trout.

It seems worthy of mention that family records covering 65 years, and supplemented by other contemporaneous data, showed that the maximum weight of any trout taken was 5½ pounds, the average of the larger ones ranging from 4 to 4½ pounds (see page 131).

On the northern, or Canadian, shore the larger fish averaged about a pound less in weight, except in the Nipigon River, where specimens reaching ten pounds were not unusual.

Now that the trout along the southern shore are approaching extinction, a tragedy assured by the improvident custom of catching the remnant at the mouths of spawning streams, it is rather surprising to learn that occasionally a fish is taken weighing 6½ pounds, the explanation be-

Photograph by George Shiras, 3d

THE THREE ADULT ALBINO DOES UPON WHICH THE PERPETUATION OF THE HERD LARGELY DEPENDS (SEE PAGE 185)

The eyes of two are light gray, and the other red, in striking contrast to the black eyes of the normal deer.

ing the greater proportion of food for the few survivors.

INTRODUCTION OF THE ANGLEWORM ON LAKE SUPERIOR

The hooks used by this ancestral fisherman were long, slender, and slightly curved, allowing the tying on of different feathers well up on the shank, and including almost invariably a strip of red flannel or a piece of similarly colored yarn, beneath which was room for one or two large angleworms. In those days the use of live bait, and especially angleworms, was regarded as sportsmanlike, and apparently justified in the case mentioned, for the fish sought were those lying deep below the surface, on a rocky bottom. To hook these big fellows was only an incident in the long, hard contest with a slender rod.

Every spring, and while the angleworms were still near the surface, small boys were engaged to dig an ample supply in the vicinity of Pittsburgh, and these were taken in a two-gallon can to Lake Superior, where they were placed in a large wooden box filled with black earth and protected against a too-miscellaneous use by lock and key, for the angleworm was not to be found anywhere along the entire lake or adjoining territory. Toward the close of each season the remainder, if any, was distributed among eager applicants, and finally found an end within the gullet of equally eager trout.

"A SERPENT OF DISSENSION"

How this apparently harmless earthworm became a miniature serpent of dissension happened once when the surplus was turned over to an elder of a village church, with directions to apportion the supply equally among his associates. Some time later word came that a great row had developed over their distribution, followed by a secession of a part of the congregation and the building of another edifice.

Photograph by George Shiras, 3d

AUTHOR'S CAMP, ST. IGNACE ISLAND, NORTH SHORE, ONTARIO

Here the tents faced 160 miles of open water, where many medium-sized trout were taken within a hundred yards, but most of the larger ones became the victims of a gill net extending to the shore, ostensibly set for lake trout of the deeper waters (see page 187).

This ancient fisherman was never able to determine satisfactorily whether he was to blame for such a breach or was to be congratulated on having brought about the establishment of two churches where there had only been one before.

In 1878, on receiving a larger remnant of angleworms than usual, I planted them in the neighborhood, with the hope that in a short while the local supply would meet future demands. At the end of three years they became very abundant in this little preserve; so some were taken to Whitefish Lake and placed in rich, deep soil near old Jack's cabin. These grew to extraordinary size and far exceeded their Pennsylvania progenitors. Some reached the headwaters of near-by streams and were carried down each spring, until most of the region showed their presence.

THE ROBIN BENEFITS BY THE ANGLEWORM'S INTRODUCTION

Meanwhile Marquette had become a systematic point of redistribution, and for a considerable time the angleworm has been found scattered along the entire south shore and at either end of the lake, there still being about 150 miles in the central portion of the north shore where I have neither seen nor heard of their presence.

If the fly fishermen are no longer concerned about the coming of the angleworm, the history of their naturalization may prove of interest to the scientist.

The robin, however, is still a beneficiary, for these worms constitute their chief diet in May and June, before the coming of the berries, and are the sole food of their first brood. Moreover, it has been noticed in the last decade that the woodcock, which once stopped briefly on their migratory flight, now linger for weeks in the alder thickets near the streams where they can always find a bountiful supply.

The gardener, too, has found a friend in this little borer, for they assist in the breaking up and enrichment of the surface soil, as the casts of this active feeder contribute much toward the quality and fruitfulness of the garden patch.

The angler and commercial fisherman, together with a large part of the public,

XUM

Photograph by George Shiras, 3d

LARGE BULL MOOSE AT A SALT SPRING ON ST. IGNACE ISLAND

The saline waters came from beneath a red sandstone stratum a few hundred yards behind the camp (see page 188).

are interested in maintaining a bountiful supply of fish, high in quality and reasonable in price, justifying their support of an effort now being made to rehabilitate the fisheries of the Great Lakes.

The recent introduction of the steelhead salmon has added another fine and adaptable fish, which, spawning in the spring, can utilize the streams for this purpose, and when unoccupied by the brooding trout in the fall.

THE SPECKLED TROUT IN DANGER OF EXTERMINATION

The species found in Lake Superior are limited in number, for the depth and purity of its water and the low temperature throughout the year have barred the coarser and less desirable kinds.

At one time the speckled trout, the lake, or so-called Mackinaw, trout, and the whitefish were present in extraordinary numbers, each occupying a somewhat different portion of the lake, according to the depth and character of the water, and all living in comparative harmony. The speckled trout depended upon minnows, insects, and crustaceans near the shore, the lake trout had an ample supply of herring, while the whitefish, a bottom feeder, in nowise interfered with the others.

There was a hardly appreciable decline in the speckled trout during the fifty years herein recorded, until it was unfortunately discovered, that during the month of August all the trout living in the lake congregated in particular streams for spawning, and these localities were then visited by an increasing number, some fishermen taking in a single day a hundred pounds of sluggish and inactive fish and often salting down the surplus for winter use.

In this onslaught others reluctantly joined; for, as the fishing became poorer each season in the open waters, they yielded on the theory that if the end were approaching, one might as well have a share in the final distribution.

Photograph by George Shiras, 3d

A COW MOOSE AT THE SAME SPRING

Here a bull moose had been illegally killed by natives just before the party's arrival and its festering body soon drove the other animals away (see page 188).

The prompt termination of this indefensible practice, and the equally bad one of running gill nets to the shore, would in a very few years restore the finest of fresh-water game fish to approximately their former numbers.

WHITEFISH FISHING WANES AS HERRING INCREASES

The whitefish, especially those of Lake Superior, have been generally esteemed as the most delicious of all fresh-water species, and when the nets were few and far apart and the methods of transportation and distribution unsatisfactory, millions of pounds were taken each season, while today, with a hundred times greater number of nets, a much higher market price, and rapid means of distribution, but a fraction is caught.

The following figures, furnished by the U. S. Bureau of Fisheries, tell the story: Whitefish, 1885, 8,000,000 pounds; 1918, 300,000 pounds. Thus it is apparent that this excellent fish is commercially extinct, but with a sufficient remnant left, if protected for a while, to be restored in waters always favorable for their support.

At one time the lake trout were in little demand, for the whitefish dominated the western markets, yet even then, with a few nets set, the annual catch approached 3,000,000 pounds, so abundant were they everywhere in Lake Superior.

The fishermen of Michigan, Wisconsin, Minnesota, and western Ontario now use sail-boats, launches and tugs for gathering the daily catch, setting gill and pound nets in all parts of the lake, sometimes two hundred feet below the surface, while larger steamers collect those taken in the more remote localities.

A DOUBLE DISASTER

Notwithstanding such a combination of efforts, the present total does not equal the number so readily taken forty years ago, with the result that the proportionately greater expenses could not now be met were it not for the extraordinary number of herring taken each fall, and these figures are significant: Herring, 1885, 300,000 pounds; 1918, 8,000,000 pounds, showing how this small and much inferior species has exchanged places with the whitefish in precisely the same period.

XUM

The present rapid consumption of the herring has become doubly disastrous, for it helps financially in maintaining the fishing fleet during their concluding attack on the lake trout, and then, with the herring gone, any future effort to restore the lake trout becomes increasingly difficult, as the latter's main food supply is thus destroyed.

Would it be possible to imagine conditions better adapted for the permanent exhaustion of the game and commercial fish in the finest and largest lake in the world?

It has long been recognized that the lack of coöperation on the part of the States and Canadian provinces bordering on the Great Lakes accounts for this situation. With each acting separately and each naturally disposed to have laws equally liberal toward their local fishermen, it follows that the State or Province spending the least money in fish culture, or having the most improvident regulations and the least efficient system of enforcement, sets the pace for the others, while the governments of each country must sit supinely by, because lacking any authorized jurisdiction over international waters in which their respective citizens have a common interest.

CANADA WILLING TO REVIVE THE TREATY

It was to meet this unfortunate situation that the United States and Great Britain negotiated and ratified a boundary waters fishery treaty, but in 1914 failure of the U. S. House of Representatives to pass an enabling act, on account of minor differences of fishermen in southern Michigan and jealousy over the proposed withdrawal of local regulations, has postponed indefinitely the operation of this beneficent agreement.

It is understood that Canada is still willing to see the treaty revived by the passage of appropriate legislation if our country will now make a move in this direction.

By such coördination of authority and coöperation in activities, the problem can be readily solved; for it is not a local question in any sense, but one that is interstate, national and international in scope.

That such a conclusion is reasonable and not speculative has already been established by the Migratory Bird Treaty, under the recent operation of which our wild-fowl are being rapidly replenished, and the more valuable insectivorous birds protected permanently in behalf of the agricultural interests of each nation.

CHAPTER VI

THE TIMBER-WOLF AN ANIMAL OFTEN MISREPRESENTED

From nearly every standpoint, the timber-wolf is an interesting animal, the only drawback to gaining an intimate knowledge of its habits being the extreme difficulty in finding any range where it may be successfully studied; for to a large extent its habits must be inferentially determined, this prowler of the night seldom coming under direct observation.

No animal possesses greater sagacity in avoiding its only enemy, man, and few show greater cunning and persistence in seeking their prey. If I were to be asked to give a predominating characteristic of the gray wolf, it would be its fear of man. Accustomed from our early childhood to hear of its savage nature, and seeing frequently in the press the harrowing accounts of men being pursued by these bloodthirsty creatures and escaping only by nimbleness in ascending a tree or perhaps by barricading a wilderness cabin, so conveniently at hand in such stories, it is not strange that in the popular mind the timber-wolf is still regarded as the arch enemy of man. But there is the best of proof to show that man has thoroughly terrorized this animal.

TWO GREAT CONTRASTS: THE WOLF AND THE DOG

The wolf and its descendant, the dog, present the greatest contrast in their respective attitudes toward man. One is distrustful and cunning, skulking in the shadows of the night, intent upon rending to pieces any less powerful animal, but having a dread of man so overpowering that they often die of their overexertion in desperate efforts to escape within a few hours after being trapped; and the other affectionate, loyal beyond comparison, intent upon faithfully performing

TWO PAIRS OF MOOSE ANTLERS INTERLOCKED

Each of fifty inches spread, inextricably joined in the deadly rivalry of the mating season, where both contestants were vanquished forever. Found near the center of St. Ignace Island (see page 188).

every service as a companion or assistant in the labors or pleasures of the day, representing the highest and most intelligent response to kindly treatment. Reversion from dog to wolf begins under a cruel master or when half starved and ill-treated by the many barbaric tribes employing the dog as a mere beast of burden.

The wolf has had every occasion to fear his human foe, for it has been trapped, poisoned, snared, shot, harassed by hounds, and a price placed upon its head. The survivors know that however much the other animals of the forest may stand in awe of them, man is ever their relentless and successful enemy, and only by the exercise of all their highly developed senses can they hope to escape the same miserable death they so ruthlessly inflict upon their prey.

THE COURAGE AND FEROCITY OF THE WOLF GREATLY EXAGGERATED

In the years spent in some of their many ranges on the northern continent, I have never seen more than twenty wolves,

IT REQUIRED THREE PADDLERS TO KEEP ABREAST OF THIS STURDY SWIMMER

Who was feeding on water plants eight feet below the surface when disturbed by our approach (see page 188).

Photographs by Paul Swift

BREAKING THE SPEED LIMITS!

Same bull approaching the shore. Both pictures were taken with a small hand camera by one of the anglers of the party, showing what can sometimes be accomplished with a small instrument.

Photograph by George Shiras, 3d

A BEAUTIFUL LAKE ON ST. IGNACE ISLAND

This lake, four miles long and nearly dividing the island, is the largest of some fifty ponds and lakes. The western shores are high and rocky and the eastern low, with shallow bays, where forty moose were seen in two days. Many of the animals feed on the water plants, six feet below the surface. While the forests look dense, all the lower limbs have been eaten by the moose (see page 187).

although hearing them howl upon hundreds of occasions and seeing their tracks in every direction.

Northern Michigan was, and still is, one of the favorite resorts of the timber-wolf, owing to the dense forests and the abundance of deer and rabbits. Here I have shot a few and trapped or poisoned a dozen or so about the camp, a favorable record, considering that of the myriad of hunters roaming this section every fall, many of them, in more than half a century of hunting, have yet to see or kill their first wolf, although they number thousands about Lake Superior (see page 133).

Nowhere in America have I ever been able to get an authentic account of a man being deliberately pursued or injured by a wolf, although out of the multitude of such stories it may be that one or two are true, for the possibility always exists of an individual animal lacking the caution of its forebears or where living in a totally uninhabited country it has not inherited any suspicions of man.

Probably the most conclusive proof of the wolf's fear of a human being is the fact that every season thousands of deer carcasses in the Lake region are left over night on the ground or hung from a branch within reach, and yet are undisturbed because of the slight scent left by the hunter. Even the entrails remain untouched until all human trace has disappeared.

A WOLF SHUNS A DEER THAT MAN HAS TOUCHED

Venison is the principal diet of the Lake Superior timber-wolf, for they think and dream about it from puppyhood days, yet these keen-nosed creatures, when the air is filled with bloody odors, refrain from touching the unguarded carcasses. This should convince the most skeptical that such an animal on detecting the presence of a traveler in the woods is not likely to attack him in the flesh, since it shrinks in terror whenever discovering anything indicating human scent about a slain deer.

XUM

Photograph by George Shiras, 3d

NIGHT PICTURE OF A COW MOOSE TAKEN BY SET CAMERA AND FLASHLIGHT

This basin of clay, impregnated with salt, had been eaten five feet below the surface. Note absence of lower branches (see page 187). A quantitive analysis of the water showed: calcium oxide, 376 parts; magnesium oxide, 22; potassium chloride, 17; sodium, 615; total chlorine, 576 parts.

Such fictitious tales never come from reliable sportsmen or from experienced trappers, but are circulated by lumberjacks, land-lookers, homesteaders, inexperienced hunters, and by sensational writers, unable to tell the difference between the hoot of an owl or the cry of a loon from that of a wolf, and, besides, are ever prone to imagine or enlarge upon the supposed perils of the forest.

Twice, however, I have had a carcass of a deer eaten by wolves when left out overnight—once where the animal was shot across a small lake and I did not go to it until morning, when I found only a few scattered remnants, and again, when trailing a wounded buck in the snow, the search was suspended at dusk, and on renewing it the next morning I found several wolves ahead, but beyond where I had stopped the night before. In a few minutes there came in view the blood-stained snow, and only the bones stripped of flesh remained. In both instances there was, of course, no trace of human scent, so the wolves had no hesitation in devouring the carcass.

A WOLF THAT DIED OF FRIGHT

On one occasion, many years ago, wolf tracks were seen on the sand beach at the end of Whitefish Lake; so a large steel trap was set in the water of the creek where a deer runway crossed it, and the same night I heard a wolf howling in that direction.

In the morning, on entering the slough, I fired at a pair of black-ducks passing overhead, and on reaching the place where the trap had been set, found it gone, some of the alders in the vicinity being uprooted, caused by the temporary catching of the clog. Upon reaching the opposite bank I found other alders had been torn to shreds, many of them still dripping with blood from the torn mouth of the wolf as it frantically tried to escape.

Believing a rifle might be needed in the more open ground, where the clog

Photograph by George Shiras, 3d

VIEW OF AUTHOR'S CAMP FROM THE SWIMMING POOL: WHITEFISH RIVER

The pictures of deer and other animals in the garden were taken between the two upper buildings shown on either extreme, while the beaver, muskrats, mink, and raccoons, as well as some deer, entered by the river front (see pages 188-193).

could be dragged readily, I returned to the camp for one. Taking up the hunt again, I soon noticed a large wolf lying on the ground with its head between its paws, almost as if asleep. On approaching the animal it was found to be dead, its body still warm.

It had probably been held fast by the clog when it heard the shot fired at the ducks, which accounted for the bloody alders, as the animal frantically renewed its efforts to escape. On reaching the hilltop the accumulating terror of its position undoubtedly resulted in death.

THIS WOLF COLLAPSED WHILE BEING PHOTOGRAPHED

That this instance is not exceptional was proved three years later in the same locality, where a wolf was trapped one night and again it howled. On the following morning, with rifle and camera, I visited the spot. The trap was missing, but the animal had not gone more than twenty yards when the log attached to the chain caught, and as I approached, the wolf raised itself to a sitting position. While I was clearing away the thick alders for a picture, it sank to the ground, with every appearance of complete exhaustion, and only by a severe prodding would it arise.

On the first snap of the camera, the animal collapsed, refusing to stir again. I certainly never expected to be sorry over the plight of such a marauder; but its bloodshot eyes, protruding tongue, the entire lack of resistance, and the dreadful sight of the broken skin clustered white with the eggs of the blue bottlefly would have appealed to the sympathy of its most relentless enemy; so a shot hastened the end.

From its condition it was plain that the animal was in the throes of death, due not to any injury, but to an overpowering mental strain, producing a complete physical collapse, and that, too, of an animal weighing eighty pounds and in the best of physical condition.

RESOURCEFULNESS OF THE TIMBER-WOLF

An illustration of the elusiveness and endurance of the timber-wolf occurred when one was found on Grand Island, in the fall of 1896. The first snow showed its presence, besides disclosing a large number of deer carcasses, including several of the imported black-tails.

Thereupon a large number of traps and poisoned bait were set out, but without result.

Then, to insure its destruction, a dozen of the best shots in the vicinity were em-

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Photograph by George Shiras, 3d

A LARGE MINK TAKES ITS OWN PICTURE AT NIGHT

This is a representation of the animal that took, on a number of successive days, a victim from among the white ducks in the swimming pool, Whitefish Lake (see page 190).

ployed to hunt the animal. Taking up the trail in the snow, it was followed continually in the daytime for four days, when the animal was slightly wounded, which only increased its watchfulness.

At the end of nearly two weeks, with relays following it all day and sometimes at night with lanterns, the wolf was finally killed. With the wages paid and the loss of deer destroyed by this single animal the cost was estimated at $1,500.

That an animal on an island, where it could be readily followed in the snow, was able to escape such a number of experienced hunters during this length of time shows how hopeless would be a similar pursuit on the main shore, where the avenues of escape are infinitely greater.

In the past fifteen years the coyote unexpectedly appeared in northern Wisconsin and Michigan, coming from Minnesota. It has since become very numerous, feeding on rabbits and killing many young deer, besides threatening the sheep introduced in the cut-over lands.

Some twenty of these animals have already been trapped on Grand Island, a game preserve described in subsequent pages, and many are taken each year to the mainland. In weight they exceed those of the prairies, evidently responding to the heavily wooded area and the nature of their prey.

CHAPTER VII

USE OF THE CAMERA IN THE DAYTIME

In previous issues of this Magazine* I have described with considerable detail

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Wild Animals that Took Their Own Pictures by Day and by Night," July, 1913; "A Flashlight Story of an Albino Porcupine and of a Cunning but Unfortunate Coon," June, 1911; "One Season's Game-bag with the Camera," June, 1908, and "Photographing Wild Game with Flashlight and Camera," July, 1906.

Photograph by George Shiras, 3d

A BEAVER VISITING THE BOAT-HOUSE IN FRONT OF CAMP: WHITEFISH RIVER

This large beaver discovered a couple of young black ash and was tempted to visit the camp clearing. Where is its tail? At no time in six years have the river beavers been seen in daytime (see page 190).

the methods employed in nature photography, both by day and night, but have omitted largely the history of its gradual development, or how it has been used by the naturalists and sportsmen as an aid to science or the establishment of a new pastime; so some additional information is not out of place.

In looking over my diaries, beginning in 1878 and continuing to date, the following brief entry appears in 1886:

"WHITEFISH LAKE, *July* 7-9.—First day wounded bear on the way out; saw two deer in camp clearing. Second day photographed a deer. Guide, Jake Brown."

At the time indicated I owned a 5 x 7 landscape camera with a single lens, of slow speed, which had to be uncapped when an exposure was made; so a tripod was generally necessary. In some respects this instrument proved more satisfactory for scenic pictures than the modern outfit, for the use of the tripod in focusing and in the study of the field to be included, besides the small aperture of the diaphragm, resulted in well-defined negatives and also precluded the carelessness so customary with a snapshot camera.

When the time finally came that the vacation was limited to the summer months, with an occasional brief hunt in the fall, the opportunity for outdoor sport was greatly reduced, but the "call of the wild" became intensified by the confinement and exactions of city life.

On these summer trips, in seeing the wild animals in the woods and about the waters, there was a lamentable lack of the interest aroused when the gun was in use. To paddle within range or cautiously approach some clearing and then see an animal slink away became monotonous to one accustomed to a keener and more exciting sport.

THE FIRST ATTEMPT TO PHOTOGRAPH A DEER

Likely it was this feeling which led to my suggesting to Jake Brown (the worthy successor to Jack La Pete) the possibility of photographing a deer. So one afternoon the flat-bottomed hunting

Photograph by George Shiras, 3d

A VARYING HARE IN A STRIKING ATTITUDE

Rarely is this animal seen in sunlight, for it feeds by night, but the white clover in the camp garden made it a frequent daylight visitor (see page 190).

skiff was prepared for the experiment, with a few green boughs in front screening the camera.

On entering the lake, an unusually large buck was seen standing upon a submerged rock opposite. Paddling through the reeds slowly, we came to open water fronting the animal, and as the bow cleared the reeds we were within forty feet of it, as it stood in a striking attitude. At this instant the boat, fortunately, ran on top of a sunken log, steadying it for the picture.

Quickly the cap was removed from the lens and then replaced. The deer, however, detecting this slight movement, ran a short distance, when it stopped, with head high in the air, gazing anxiously in our direction.

TWO PICTURES SPOILED AT ONCE

Meanwhile I had replaced the slide, reversed the plate-holder, and had time to make a second exposure, when with a single leap the animal cleared the bushes fringing the water.

More excited than if I had killed this splendid specimen, the slide was picked up to cover the last exposed plate, when I was stunned at seeing the light-colored negative staring me in the face, for I had withdrawn the outer slide while watching the deer moving off, thereby destroying the first negative and not exposing the second.

Jake, of course, could not understand how it was possible to spoil two pictures by a single mistake; so, without any undue discussion about the manner in which I had blundered, the boat was headed for the slough, where a large doe was ready for the next effort. Somewhat suspicious of the partly screened boat, she allowed time for the removal of the cap, but before it could be replaced she ran back into the forest. On developing the plate, there could be seen the faint outline of the doe, and then a long white streak representing her retreat.

Following this short experience, it was apparent that only by the best of luck was it possible to get pictures of deer with such an outfit, and while just such luck had favored the initial effort, "buck fever" of the earlier days had brought almost complete failure.

THE FIRST PHOTOGRAPHIC APPARATUS OF ITS KIND

Several seasons previously, a friend of mine had procured a 4 x 5 outfit, called the "Schmidt Detective camera," having a high-grade, rectilinear, Dallmeyer lens, with a fairly rapid shutter, which could be set and released by a string and button on the outside of the box. This apparatus, which was the first of its kind, equaled the modern ones in effectiveness, and for my purpose proved very much better, for the plate-holders and lens were inclosed in a light, tight, waterproof box.

Using this camera, during the next season I was able to get several good pictures of deer. The lens, however, was of short focus, so it was necessary to get within about twenty-five feet of an animal for satisfactory results, and this was difficult in bright sunlight. So then I tried sitting in a blind near a runway or

Photograph by George Shiras, 3d

A GREAT BLUE HERON OPPOSITE THE AUTHOR'S CAMP

Frogs in the reedy shore across the stream attracted the blue herons, but the camp was watched closely by these cautious birds, Whitefish Lake (see page 190).

where the deer came to feed, but the shifting currents of the air usually indicated my presence before the quarry approached close enough, showing the difference between shooting an animal some distance away and trying to photograph it within a few yards.

ANIMALS MAKE THEIR OWN PORTRAITS

During subsequent seasons this difficulty was overcome by running a thread across a runway or the beaches, with the camera concealed a short distance away, and in this manner pictures were obtained without effort and of very excellent quality. Later, when leaving the camera out all day, it could be reset for night with a flashlight, and thus it was at work twenty-four hours—an important advantage when in the remote wilderness for a brief time.

Another method was to place two or three cameras in different parts of the slough, and when an animal passed in front of one the shutter was released by pulling a string suspended through screw-eyes on saplings and running thence to a scaffold in a tree overhanging the water, where I could release the shutter of a camera by pulling the right string, the deer always stopped when I gave a shrill whistle (see page 134).

It seems odd now that in the beginning I had selected as an object for the first camera hunts the most cunning and elusive of the deer family instead of trying an easier subject, like a porcupine, a squirrel, or some of the many semi-tame birds nesting in the clearing about my camp. Of course, the explanation lay in the fact that I simply wanted to hunt deer, and the camera gave the means of gratifying this desire.

A QUOTATION FROM THE PAST

Soon the real and lasting merits of this instrument as a sportsman's adjunct became more and more apparent, and in such belief I wrote in advocacy of this new pastime an article published in 1891. It indicates a violent reaction against useless destruction, but it at least bears witness to a confidence in the camera as the sportsman's best friend.

Photograph by George Shiras, 3d

A DEER FAMILY FEASTING ON MOUNTAIN-ASH BERRIES BEFORE THE BOAT-HOUSE

These wild berries were so placed that deer passing toward the garden would fire the flashlight, showing the boat-house in the background (see page 191).

"A sportsman's life consists largely of three elements—anticipation, realization, and reminiscence. The look forward to the trip by rail, by canoe, and then perhaps a tramp on foot into the heart of the wilderness; then the camp and its pleasant surroundings, and that memorable day when the early morning sun casts a glint upon the branching antlers of a mighty moose as, half concealed in the thicket, he furtively browses his way along; the breathless wait until the neck or shoulder becomes exposed; the shot, and then—success—that is, sudden death, or perhaps delightfully intensified by a hasty scramble after the wounded beast on a blood-stained trail, at the end of which we find our victim dead or dying.

"Would that we could realize that what is game to the rifle is game to the camera! Nearly every sportsman will admit that the instant his noble quarry lies prone on the earth, with the glaze of death upon the once lustrous eye, the graceful limbs twisted in the rigors of death and the tiny hole emitting the crimson thread of life, there comes the half-defined feeling of repentance and sorrow.

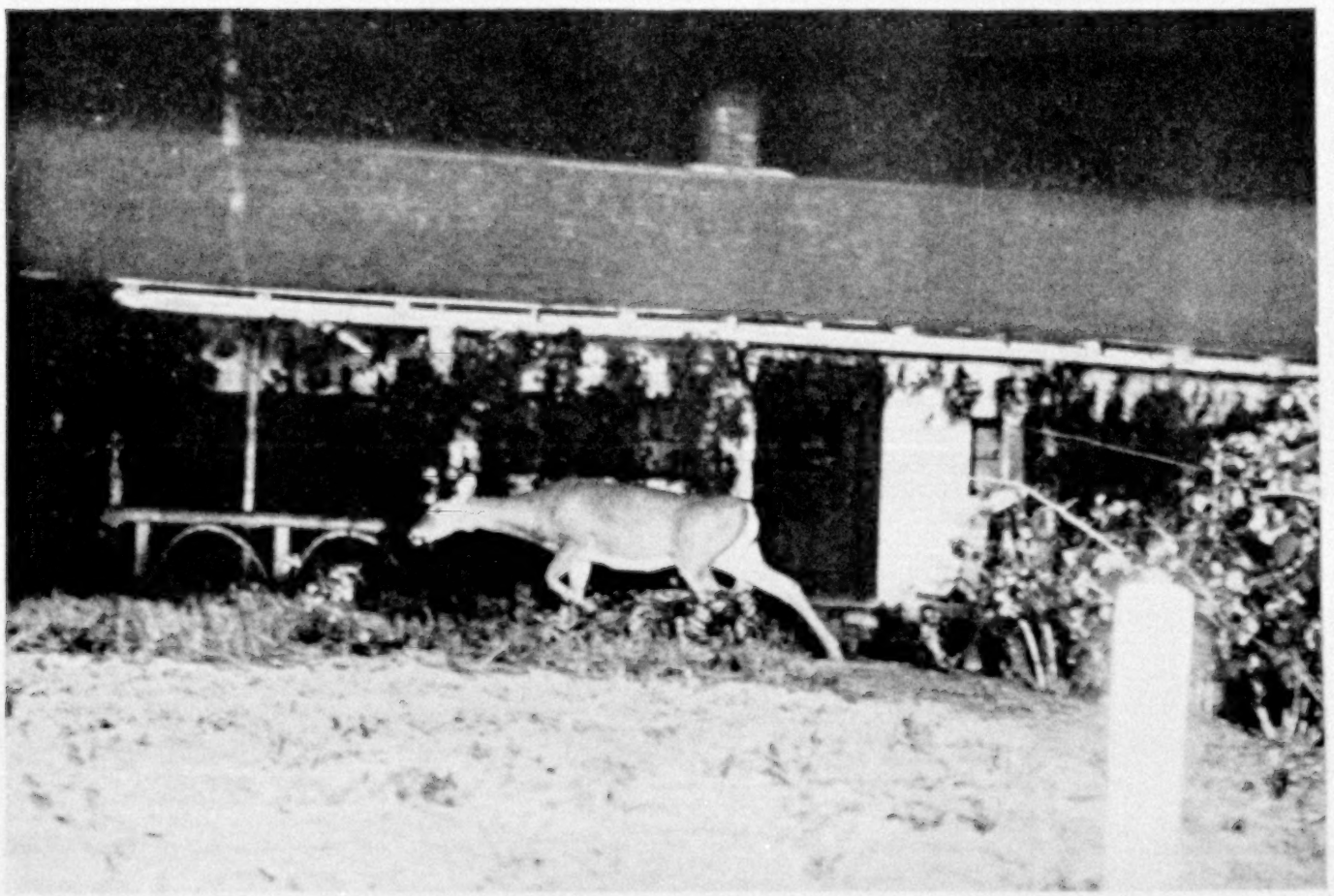
"The great desideratum, after all, consisted of neither meat, nor antlers nor hide. Therefore the conclusion is reached that much of the large game, when successfully hunted, is the victim of an abnormal incentive.

"Surely we do not travel a thousand miles, indifferent to time, labor, and expense, to get a few hundred pounds of wild meat, probably not half so toothsome as the domestic cuts in the market stalls of our own town and costing very much more.

THE THRILL OF THE CAMERA HUNT

"Every camera hunter will admit, even though once a successful sportsman, that there is more immediate and lasting pleasure in photographing a deer at twenty yards than in driving a ball through its heart at one hundred yards. Then, think of the unlimited freedom of this noiseless weapon. No closed season, no restriction in numbers or methods of transportation, no posted land, no professional etiquette in the manner of taking your game.

"You can pull on a swimming deer or an elk floundering in the snow; take a crack at a spotted fawn; bag the bird in its nest or string your cameras out with a thread across the runway and gather in



Photograph by George Shiras, 3d

VISITING THE CARROT PATCH

This doe selected its favorite vegetable within ten feet of the cabin containing the dining-room, wherein many a haunch of venison has been served during the hunting season. At no time are these night visitors seen in or about the garden in daylight. Cautious as they are, many of them lose their lives in the hunting season, a few months later, in which hunts the writer no longer participates (see page 191).

the exposed game-laden plates at nightfall without any scruples of being called a pot-hunter.

"By and by you will have a collection of pictures affording more enjoyment than all the mental ghosts of slaughtered quadrupeds and all the moth-eaten relics of the gun; for, when one covers an elk or a moose with his single barrel, close shooting, long-focus lens, there is no pulling off the hide while the coyote and the birds of prey feast on a thousand pounds of meat too rank in the rutting season for food or too cumbersome, if edible, to be generally available.

"In each essential particular the camera requires all the proficiency and affords all the pleasure that a steady hand and a deadly weapon ever gave a lover of field sports, and more besides.

"It is only within the last few years that compact photographic appliances, quick shutters, rapid dry plates and films have made possible successful work on large game, or otherwise some of us might have reformed before."

Whatever may have been the writer's particular contribution toward wild-life photography in the daytime, it was of a non-essential character, so far as the immediate future was concerned, for the method would soon have developed naturally on the coming of proper apparatus.

A year or two later Wallahan, of Colorado, on his own initiative and with an ordinary tripod camera, succeeded in getting a remarkably beautiful series of the mule deer during their descent from the mountains each fall, and later, with better equipment, photographed many other animals in his State.

Then Chapman, our leading ornithologist, began picturing birds, his collection not being surpassed by any individual at the present time; followed by Kearton, of England, who soon became the foremost bird photographer across the seas.

The next effort of the writer was to

try photographing animals at night by flashlight, about the waters in the vicinity of his camp. In this experiment many difficulties arose, which may best be considered as a separate subject.

WILD LIFE PHOTOGRAPHY BY NIGHT

In the earlier days, about Lake Superior, the old Indian method of "fire-hunting" deer proved most fascinating. True, this practice has long been outlawed as unsportsmanlike, since it required little skill and became very disastrous when followed systematically by market hunters.

Even at that time, the real pleasure in hunting at night, to most of us, was not so much the actual shooting as the keen enjoyment derived in paddling quietly along the winding streams or the well-wooded shores and bays of some inland lake, where in the quietness of the night every sound was audible, and one readily learned to know the different animals before they came within the circle of the light.

Unless the primary object was obtaining meat for camp, it was disappointing if a deer were killed within the first half hour, thus ending the trip.

Another method of night hunting was the use of a headlight on shore, the hunter quietly wandering about in the blackness of the forest looking for a pair of gleaming eyes, fifty or more yards away, and then with a rifle trying to put a ball between the few inches separating these brilliant orbs, requiring an accuracy of aim, a knowledge of the woods, and a skill in still hunting quite up to the standard in daylight shooting.

But here again the market hunters became so proficient under conditions already described that this method also had to be prohibited.

THE IDEA OF NIGHT PHOTOGRAPHY CONCEIVED

Having taken daylight pictures of deer in various ways, the question then arose whether there was any possible means of doing this at night, when the deer were much more active and could be approached more easily than at other times, thus reviving, in a harmless but interesting way, jack-light hunting, so little known by those of the present day.

Assured by an extended experience in both methods of hunting under the light, there seemed little doubt about getting close enough for pictures, provided the magnesium powder was a sufficiently powerful illuminant and had the requisite speed.

"SHOOT THE DEER FIRST"

This new endeavor was mentioned to Jake Brown in the summer of 1889, but he was still a trifle irritated over an experience of the previous fall, when, after the season had opened, I photographed a fine buck and shot at it afterward, resulting in badly wounding the animal as it ran away, entailing a half day's search before it was overtaken and put out of misery, for the lower jaw had been crushed by the rifle ball, giving a pitiful illustration of how some animals must suffer in the name of sport.

This led Jake to exclaim that if the camera must be used, the best thing to do was to shoot the deer first and photograph it afterward! However, as the season would not open for several months, he got the boat ready for the night, while I attempted to devise some sort of a flashlight apparatus.

A small hole was made in the center of a tin plate, in which was placed a strip of oiled paper that would burn readily when ignited underneath, and on top was placed the magnesium powder.

The approach was to be made in the usual way, with a jack-light.

FIRST ATTEMPT PARTLY SUCCESSFUL

This first effort was entirely successful, so far as getting within range; but just as the lower end of the paper fuse began burning, the deer ran off with a snort of disapproval, the flash taking place after it was out of sight. Jake, as might have been expected, indulged in his usual guffaw, while I hopefully began preparing another charge.

At the left-hand corner of the sand beach stood a large doe, much interested in the approaching light, and soon the boat came within 25 feet, the flashlight being fired when the animal was apparently motionless.

On developing the negative the body of the deer was satisfactory, but the head had moved so violently the animal seemed decapitated.

XUM

Photograph by George Shiras, 3d

FINISHING UP THE BRUSSELS SPROUTS

This deer took its picture at midnight before the cottage of the caretaker, whose sleep was doubtless momentarily disturbed by the explosion. But, as such raids were a continual strain on the temper of the gardener, he always welcomed the sound of the flashlight (see page 191).

This unexpected result was discouraging, so several trials were made the following night; but again the pictures were nearly worthless, for the same reason as the first, showing that the powder was too slow for an active creature like a deer when facing a slowly exploding illuminant.

Later experiences proved, however, that even with this crude apparatus a good picture might have been taken occasionally had the flashlight been discharged when the deer had its head down or was turned away from the water.

During the ensuing winter I learned of a flashlight apparatus designed for taking pictures in theaters, ball-rooms, or other large interiors, consisting of a metal standard supporting three circular alcohol lamps, into the flames of which could be projected a spray of magnesium powder by means of a rubber bulb connected by tubing with a receptacle containing enough powder for half a dozen flashes.

This apparatus, with its great power of illumination and ease of manipulation, seemed suitable for solving the problem.

UNEXPECTED PYROTECHNICS

On the first dark of the moon the following July I left camp in a canoe with the new outfit in the bow and the ever-faithful Jake astern, going downstream from camp to avoid the winds of the open lake.

A reflector had been placed behind the three lamps with the idea of covering the jack and utilizing the other light when finally approaching a deer.

In one place it was necessary to lift the canoe over half-submerged rocks; but, as we both wore gum boots, this was easily done. Shortly afterward it was realized that this little portage had probably saved the flashlight hunter from severe injuries.

On rounding the next bend a pair of

Photograph by George Shiras, 3d

A DOZEN FROGS CATCH NEARLY ONE THOUSAND BUTTERFLIES

Early in August, 1919, the half dozen little Leopard frogs living in the camp water garden near Whitefish Lake were seen catching, every few minutes, butterflies known as "the little white-banded blues," as each alighted on a row of forget-me-nots bordering the water. Frequent observation during a week indicated the killing of fully 500 butterflies. On the bank of the stream was a bed of sweet-william, where another set of the little green frogs lay in wait, these catching a brown species (shown above) almost as frequently. It is worthy of note that two distinct species of butterflies fed exclusively on two different species of domestic flowers. The brown butterflies, however, fed by the hundreds on joe-pye weed along the stream, but beyond reach of the frogs. The photograph was made from above, causing the butterfly (*Argynnis aphrodite*) to appear disproportionately large.

glowing eyes attracted attention, and in a moment the three lamps were ablaze and the jack-light covered. On approaching, the deer jumped to one side, requiring the canoe to change its course, for I had not then in use a revolving table capable of covering any quick movement of an animal.

In turning to whisper instructions to Jake, my elbow unfortunately caught on the rubber tubing, toppling the entire apparatus into the bow, where the cap of the reservoir became detached, permitting the escape of all the powder, part of which clung to the wet surface of the rubber boots, the remainder going into the bow, where a portion was set on fire by the overturned lamps.

There was a tremendous explosion of the drier powder, and the damper portion gave forth a brilliant spluttering, compelling me, in a cloud of stifling smoke, to leap overboard in order to extinguish the blaze on the boots and later in the boat.

Having been turned toward the paddler when the mishap occurred and because much of the powder was wet, my eyes were protected, affording an early warning in the handling of such an explosive.

JAKE GETS A DUCKING

When Jake learned that no particular harm had been done beyond the puncturing of a chimerical scheme, he gave vent to unrestrained mirth. Standing waist deep in the slowly moving current, my hands smarting from the touch of the flames, and the little camera floating about in the murky waters, any humor

in the affair was not particularly noticeable to at least one member of the party.

Opening the cover of the jack-light and turning the rays toward the stern, the sight of Jake in a state of hilarity, with a superabundance expressed by whacking the paddle on the water in rhythm with each outburst, I gave an upward pull on the already-elevated bow of the canoe, and down went the stern to the bottom, only Jake's eyes showing above the surface, stifling every sound except a little spluttering.

As Jake struggled to his feet, a grinning countenance showed his willingness to take good-naturedly this somewhat rude form of reprisal. In a few minutes the boat was ashore, the water removed, and the camera found on a near-by sandbar. While returning, my now sympathetic assistant attempted a diversion by pointing out in graphic language how surprised the deer must have been "when the moon blew up," but the monologue was not interrupted.

A SUCCESSFUL FLASHLIGHT APPARATUS IS DEVISED

In the succeeding months experiments were made with a new powder, called Blitz-pulver, a compound possessing great brilliancy and rapidity, and only requiring an apparatus that could be quickly and safely handled to insure satisfactory results.

Sportsmanlike, the idea of a pistol flashlight then suggested itself.

During the winter I had made a tin box an inch deep and seven by four inches wide, containing an iron bed-plate on which a spring-actuated firing-pin could be released by a trigger beneath the box, using for ignition a capped, but empty, pistol cartridge, which extended through an upright shoulder far enough to penetrate an opening in a pill-box containing half an ounce of powder.

This contrivance, when tested, showed it could be fired with the quickness and certainty of a gun, the strong metal bed-plate protecting the hand when the machine was held overhead.

On next returning to camp in the summer of 1891, I found that Jake would be occupied several months building a hunting cabin for a relative of mine on a little lake several miles to the west; so the next experiment had to be tried with a different paddler in the stern.

Fortunately, a good substitute was at hand, for some years previously I had employed, occasionally about the camp, but more frequently in fishing along the shore, a Norwegian named John Hammer. Although a machinist by occupation, since coming to this country, in the early eighties, his racial fondness for the water led his employers to take him on camping trips, where his expertness as an oarsman, a paddler, or in running a naphtha launch finally led him to act as a guide during the summer and fall months.

Sending for John, I explained that he was to take on a novel occupation, that of "a flashlight guide," and for an indefinite period, little anticipating his continuance in that capacity to the present date, a period of more than thirty years and covering expeditions throughout much of the northern continent.

John accepted this invitation with surprising cheerfulness, for in those days the idea of using a camera instead of a gun did not take very well with most guides, who naturally thought that in hunting big game there should be something more substantial to show than the image of what, in the flesh, represented a fine stew or roast.

Perhaps part of the explanation lay in the fact that at his own former home in Christiania he had served as an apprentice in an optical works and had always felt a considerable interest in photography, thereby viewing his new duties with a seriousness and appreciation speaking well for my future efforts.

One night about the middle of July, in the following year, the new apparatus was put into the canoe and a start made up the river under the confident belief of a greater measure of success than had heretofore fallen to my lot.

THE FIRST SUCCESSFUL FLASHLIGHT OF A DEER

On the way to the lake several deer bounded off, but too far away for a picture. Passing along without looking for any animals in the reeds, as the open shore of the slough afforded a less obstructed view, we entered it with no idea of seeing a deer for several hundred yards, and were, therefore, surprised on

discovering a pair of shining eyes of what proved a yearling buck, only a few feet beyond old Jack's landing, where, as a boy, I had brought in triumph a little buck as the first victim of the gun.

What a coincidence if, on the same spot, I could now obtain an image much more lasting than the vanished one of years ago!

The deer viewed the approaching light with unusual curiosity, raising and lowering the head as if to look under or over the jack-light. Just as the neck was craned and the head elevated, the flash was fired, the camera hunters and the deer being equally blinded, for at that time we had not learned the advantage of closing one eye when the explosion took place.

Before our vision had returned the deer was heard struggling through a mass of alders, and then, without making another trial, we hastened to camp, where the developed plate showed the little buck in the center of the scene, with a foreground of reeds and a background of alders and cedar, depicting the first successful effort in the recording of an animal on its midnight rambles (see page 135).

THE LURE OF NIGHT HUNTING WITH A CAMERA

Having, therefore, learned in the succeeding year that night hunting with the camera possessed a greater attraction for the average sportsman than when the object was the death of the animal, I endeavored to show this through the columns of an outdoor magazine, and as a part of the present record its reproduction may be in order, especially as these early views have been more than sustained in the twenty-five succeeding years:

"Selecting a dark, warm night, a flashlight hunter prepares his cameras, lights the jack-lamp, loads his flashlight apparatus with magnesium powder, and in his canoe pushes out into the silent waters of the lake or river. The paddle sends the slight boat ahead so easily that no sound is heard except a gentle ripple, unnoticeable a boat's length away. The wooded banks are wrapped in deepest shadow, only the sky-line along the crest showing their course.

"At the bow of the boat the bright eye of the jack-light is turning from side to side, cutting a channel of light through the waves of darkness, showing, as it sweeps the banks, the trunks of trees and tracery of foliage with wonderful distinctness.

"Soon the quick ears of the men in the boat detect the sound of a deer feeding among the lily beds that fringe the shore. Knee-deep in the water, he is moving contentedly about, munching his supper of thick green leaves.

"TWO BRIGHT BALLS SHINE BACK"

"The lantern turns about on its pivot and the powerful rays of light sweep along the banks whence the noise came. A moment more and two bright balls shine back from under the fringe of trees; a hundred yards away the deer has raised his head and is wondering what strange, luminous thing is lying out on the surface of the water.

"Straight toward the mark of the shining eyes the canoe is sent with firm, silent strokes. The distance is only seventy-five yards, now it is only fifty, and the motion of the canoe is checked till it is gliding forward almost imperceptibly. At this point, if the hunting were with the firearm, there would be a red spurt of fire from under the jack-light, and the deer would be struggling and plunging toward the brush; but there is no sound or sign of life, only the slowly gaining light.

"Twenty-five yards now, and the question is, Will he stand a moment longer? The flashlight apparatus has been raised well above any obstructions in the front of the boat, the powder lies in the pan ready to ignite at the pull of a trigger; everything is in readiness for immediate action. Closer comes the boat, and still the blue, translucent eyeballs watch it. What a strange phenomenon this pretty light is! Nothing like it has ever been seen on the lake during the days of his deerhood.

"A CLICK, A WAVE OF LIGHT, THEN DARKNESS"

"Fifteen yards now, and the tension is becoming great. Suddenly there is a click, and a white wave of light breaks out from the bow of the boat—deer, hills,

Photograph by George Shiras, 3d

BEAVER REPAIRING DAM AT NIGHT

For the purpose of showing a dam and the beaver at work on it, a break was made one afternoon, and when the animal came after dark to investigate the cause of the falling water, a set camera and flashlight pictured it within the break. Taken in October, 1912, 45 miles west of Marquette (see page 197).

trees, everything stands out for a moment in the white glare of noonday. A dull report, and then a veil of inky darkness descends.

"Just a twenty-fifth of a second has elapsed, but it has been long enough to trace the picture of the deer on the plates of the cameras, and long enough to blind for the moment the eyes of both deer and men. Some place out in the darkness the deer makes a mighty leap. He has sprung toward the boat and a wave of water splashes over its occupants. Again he springs, this time toward the bank. He is beginning to see a little now, and soon he is heard running, as only a frightened deer can, away from the light that looked so beautiful, but was in fact so terrifying.

"What an account he will have for his brothers and sisters of the forest of a thing which he himself would not have believed if he had not seen it with his own eyes. In the boat, as it slips away from the bank, plates are being changed and the cameras prepared again for another mimic battle."

MAJORITY OF WILD ANIMALS ARE NOCTURNAL

In the course of time it became plain to the writer that the easiest and most satisfactory method of picturing wild game was through the use of the flashlight, for by far the greater number of wild animals are nocturnal, and when occasionally seen in the daytime can rarely be approached sufficiently near with a camera or when the light is favorable.

However, it was many years before any one else could be induced to make the effort, for it seemed hard to find one who was both a naturalist and a photographer,

XUM

Photograph by George Shiras, 3d

BEAVER CUTTING DOWN A BLACK ASH AT NIGHT: THE FIRST PICTURE OF ITS KIND

For two weeks the camera and flashlight faced this partly cut tree without result. Then one night the beaver came, leaving his picture as well as the tree, for it stands today unfelled, proof that a single animal does the work (see page 197). He was too frightened by the flash to return that season.

or, being such, had any knowledge in the use of flashlight powder and the means of approaching animals at night.

Finally, many years later, Nesbit and Dugmore, of this country, became interested, followed by Schilling, of Germany, the latter two of whom obtained remarkable night pictures on their African expeditions. Then came a host of others, whose fine and ever-increasing collections indicate the success and permanency of this method of night photography, both as a sportsman's pastime and for the scientist, when desirous of presenting wild life in its natural habitat.

PHENOMENA OF FLASHLIGHT COMPOUNDS

The range of illumination, out-of-doors, of the modern flashlight powders is limited in animal photography to about fifty feet, unless a very heavy charge is used, in conjunction with a long-focus lens.

However, the direct and collateral rays of this powder have an extraordinary range.

Homesteaders living four or five miles beyond the author's camp for some years have noticed the sudden glare of light on the sky overhead, and by inquiry finally traced the origin to the flashlight pictures being taken at or near the camp.

This led to a careful and more extended test. By prearrangement, an ounce or so of flashlight powder was fired one night in the camp, surrounded by high trees, while well below the horizon at Marquette, 20 miles distant, spectators were to report the result. They noticed a bright illumination, not only above the camp site, but its extension apparently for five or six miles along the horizon, resembling heat lightning, except for its steadiness and straight lines. Subsequent trials did not vary.

Flashlight rays will penetrate clear water for a considerable distance at night, making possible subsurface pictures, so difficult of accomplishment in the daytime, and will also permit the photographing of the interior of a room through closed windows, when the camera and flashlight are at a considerable distance on the outside—an impossibility in daylight (see picture, page 191).

Moreover, when these rays come in contact, at right angles, with those of a strong searchlight, a mile away, there appears a peculiar and very noticeable fluttering at the junction, not unlike heat lightning. This too, was tried a number of times. Apparently flashlight powder possesses properties unlike any other artificial light, and warrants an investigation by a physicist, or at least an explanation from one. So far no solution has been offered of the last phenomenon.

CHAPTER VIII

GRAND ISLAND AND ITS HERD OF ALBINO DEER

Doubtless many former readers of "Robinson Crusoe," who later have had occasion to explore remote places on land or sea, retain a special interest in islands, more particularly when such places are in a primeval condition, with a variety of plant and animal life.

Physical barriers serve not only in preserving the purity of a given species, but are often the means of furthering the origin and continuance of new forms; for all organic life has its abnormalities, and some may develop a freakish manifestation into a permanent character, just as others yield gradually to environmental influences, especially where not indigenous to the region.

Lying athwart the entrance of one of the few deep bays on the southern shore of Lake Superior is Grand Island, true to its name in size and beauty. Terminating the westerly end of the famous Pictured Rocks, its giant sandstone cliffs on the north end face the widest portion of the lake, while the nearly land-locked waters on the inner side afford the only natural harbor for many miles (see map, page 114).

CAMPING PLACE OF OJIBWAY INDIANS FOR CENTURIES

This was the camping place of the Ojibway Indians for many centuries, and later a trading post was established, with the interesting life incident thereto.

When tourist travel began, in 1855, on the completion of the first lock at Sault Ste. Marie, this precipitous part of the coast, with its multicolored cliffs and castellated rocks, was seen at close range from the deck of passenger steamers.

Grand Island, with a shoreline of about

XUM

Photograph by George Shiras, 3d

NIGHT PICTURE OF A BEAVER PLASTERING HIS HOME WITH MUD

In the fall these animals renewed the covering of mud on their house, not only for comfort, but as a protection against marauding animals, which cannot tear the structure apart when cemented with frozen mud. The picture shows the home of the beaver colony living on the river half-way between the author's camp and Whitefish Lake (see page 197).

40 miles, heavily forested, containing lakes, ponds, and overflowing streams, was always the resort of wild game, the deer in particular being attracted by several natural salt licks near the center of the island.

When a youth, I camped each season with older members of my family on the opposite shores, where so abundant were the trout, deer, wild pigeons, and grouse that only on rare occasions was the island visited.

THE ISLAND CONVERTED INTO A GAME PRESERVE

Whenever I ventured into the dark, tangled forests, it seemed that the deer had inherited a greater degree of sagacity than those roaming in comparative safety throughout the unbroken wilderness ashore, due, doubtless, to the peril of island segregation and the inherited fear of the Indian and the fur trader, who made this locality a general rendezvous and hunting ground.

Providentially, in modern times this beautiful island has been saved from the ravages of the axe and the too deadly use of the gun, for a number of years ago it was acquired by a mining and lumber company in the purchase of a larger tract ashore.

Unlike many of the pioneer corporations of the West, this company has always shown a commendable interest in the welfare of the various communities in which it has operated, leaving more than a fair equivalent for that which must be destroyed. It was this spirit which led to an extensive effort to protect the native wild game and to introduce new or foreign species most likely to succeed in a northern country.

Starting with a hundred or more native deer, moose were introduced, together with elk, caribou, black-tail deer,

Photograph by George Shiras, 3d

THE LODGE OF THE RIVER COLONY OF BEAVERS

Showing a great collection of brush and small logs stored in the pool before the house for their winter supply of food (see page 181).

antelope, and several hundred pairs of Scandinavian game birds. For the use of the last-named, thousands of young Scotch firs were successfully planted, to provide their natural winter food. The results of this experiment are interesting and of value for the future.

The Scandinavian birds, principally capercailzie, raised a brood or two, and then fell victims to birds of prey and ground vermin, showing their inadaptability in a country otherwise suitable. Their foes were too numerous and were different from those across the sea.

A HERD OF CARIBOU PLUNGES TO DEATH

The first herd of Newfoundland caribou on a stormy winter night went headlong to their death when pursued by a stray timber-wolf. They leaped from one of the higher wooded cliffs into Lake Superior, under the sheep-like influence that causes these animals to follow a leader and to regard the distance traveled rather than cunning evasion the best means of eluding a pursuing foe. The entire herd perished (see page 144).

The next importation of caribou developed both species of bot-fly that have always proved such a dreadful and unsightly affliction on their native island; but, unable to suffer and recover, as in their original habitat, these animals also came to a pitiful end.

Again, a wolf crossed on the ice and, getting beneath the game fence confining the animals to the higher ground, soon put an end to the black-tail deer, for they lacked the elusiveness of the white-tail; while the antelope, as rather expected, found the few clearings too small for their roaming habits, and in the deep snows characterizing the upper lake region they gave up the struggle for existence.

THE MOROSE MOOSE VANISHED, TOO

The moose at first thrived and bid fair to succeed in a country adapted to their ways, but on the tremendous increase in the white-tail deer and elk, they refused to travel the runways of their uncongenial rivals. They secreted themselves in a swamp bordering a small lake, where lack of range and food brought on disease, and then these morose and stolid animals vanished, the usual result with moose when too confined—a fact which accounts for the rarity with which they are found in zoölogical parks.

The native white-tail, therefore, won the day against all enforced intruders except the elk. Consequently in these two species we have the ones best adapted for

Photograph by George Shiras, 3d

A TYPICAL SCENE ON WHITEFISH RIVER

From 25 to 30 ash are in different stages of felling or dismemberment, showing that these beavers do not finish one tree before beginning on another. Average time in felling a tree, ten days (see page 197).

the unoccupied ranges throughout the more easterly part of the country.

A closed hunting season on any island, however big, will finally bring most animals face to face with an unavoidable enemy—starvation. Thus it became necessary to supply some food in winter, besides shipping hundreds of deer and surplus elk to parks and game preserves, followed still later by an open season on deer.

THE BEGINNING OF THE ALBINO DEER COLONY

If, however, this long and costly effort to make Grand Island the permanent home of many immigrant species has proved disappointing, an unexpected reward has come, which may eventually prove of greater value than the fulfillment of the original plan, namely, the establishment of a beautiful herd of albino white-tail deer.

A characteristic of the Michigan deer has been the general uniformity in physical appearance; for, though more deer have been killed in Michigan during the past fifty years than the aggregate elsewhere, there are very few freaks in antlers or extremes in weight, while albinism has been equally rare.

Some ten years ago word came that a fine albino buck had been seen frequently on Grand Island coming to a little pond on the easterly side. Taking a camping outfit, a canoe, and my guide, several days and nights were spent watching the pond, and although other deer came during the day or were seen under the jack-light, the white buck did not appear.

The next year the quest was no more successful, and when I heard that on the opening of the season the white buck had been killed, it was a consolation to know that the body was in the hands of a taxidermist, preparatory to being added to the little museum of the island hotel.

There, later, I took the measurements of the antlers and body, and then, to show what a striking picture such a marbled figure would present with a background of black, the mounted animal was carried one evening to the edge of the forest where once it had roamed and the flashlight fired (see page 148).

Feeling quite confident, from the age of this buck, that white descendants would sometimes be found, a careful watch was maintained throughout the island.

Finally, in the fall of 1915, a good-sized albino buck was noticed loitering about the box traps set for capturing deer to be shipped away. With little effort it was taken.

Upon the removal to temporary quar-

Photograph by George Shiras, 3d

FELLING A TREE UNDER DIFFICULTIES

A beaver cuts through the average tree in a space between 18 and 25 inches above the ground. After cutting on the opposite side this beaver had to finish the job while seated on a log. Note its resemblance to a large muskrat (see page 194).

ters it was found that the buck was suffering from an injury to the spine and was unable to stand.

Recognizing the rarity of such a capture, a regular attendant was placed in charge, and daily it was fed and watered in a reclining position. After a month it recovered sufficiently to walk about, and by spring was in good condition.

DEER WOULD NOT ALLOW KEEPER TO CHANGE HIS COAT

Then an odd thing happened. The faithful caretaker, on approaching the stall one morning, was surprised at the buck showing the greatest terror, plunging about in a way to threaten new injuries. Retiring at once, the question arose as to the cause. Remembering that for the first time he had not worn his winter fur coat, it was replaced, and the buck became docile at once, showing how animals, usually dependent upon scent, may associate an outward garment with identity. Possibly this old fur coat had an odor of its own!

Then the idea of establishing a herd of white deer suggested itself, and with this in view four red does were captured and placed in a good-sized range with the white buck.

A WHITE FAWN FOUND

A few weeks later the project was favored by finding a female white fawn, a day or two old, in a thicket near the island hotel. With careful attention and in the company of another fawn, it grew rapidly.

During the earlier months this fawn had the usual row of white spots on the back and sides, and although there was no difference between these and the body color, they were conspicuous in the same way that satin needlework in a single color may carry a varied pattern (see page 147).

The following year one of the red does in the inclosure bore an albino doe fawn, which lacked, however, the brocaded white spots characterizing the previous one.

XUM

Photograph by George Shiras, 3d

CUTTING DOWN A GREAT BLACK ASH: WHITEFISH RIVER

The principal winter food of the beaver on the lake and river is obtained from the hundreds of black ash growing only a few inches above the water level and reached by side channels or sometimes artificial canals. After the smaller ones were cut came others of considerable size. The tree in the picture is 91 inches in circumference, and for three years different beavers have attempted to cut it down, but the flashlight has discouraged the completion of these efforts. The animals store the branches of the tree and eat the bark.

By this time the first fawn had become a yearling and was placed in the same inclosure. Three years ago I learned that there was a yearling albino doe at the State Game Farm, and in a few weeks it was safely transported to Grand Island, where such an addition in new blood has proved of undoubted value.

Then came a telegram in 1919 that the white buck had died suddenly in November, leaving only a buck fawn as the future head of the herd.

In the following spring, however, a posthumous white fawn was born, followed by the favorable news that a large albino doe and two white fawns had been seen on several occasions in a remote part of the island, and these latter can be placed in the inclosure if deemed advisable.

XUM

It may be of interest to note that the original buck weighed about 150 pounds and possessed a rather extraordinary set of antlers, spreading 26 inches, with the terminal points much farther apart than any other I have ever seen.

VELVET ON ANTLERS WAS SNOW-WHITE

The velvet on the antlers of both bucks was snow-white, giving them a most statuesque appearance amid the green foliage of the forest.

The eyes of the native albinos are a very light gray-blue, while the doe from the southern portion of the State has the usual red eyeballs. The lack of any pigment in the layers of the retina of this latter individual discloses the red blood-vessels characterizing most albinos, making it very susceptible to a bright light.

The second buck differed from the original one in being somewhat larger, but had only two long spikes of about eighteen inches, the left one slightly forked each season.

The albino deer shed their white summer coat at the usual time, and it is replaced by a heavier and thicker covering, though not quite so long as the winter gray coat of the normal deer. The skin is a light pink, showing plainly through the thin summer coat, in contrast with the almost black epidermis of the other deer. The hoofs and skin of the nostrils are a pearl-gray, instead of black, while the velvet on the growing antlers is white, but when freed from this covering the antlers have the usual brownish-yellow coloring, the only exterior part of the white deer resembling the normal ones.

THE FIRST ATTEMPT TO PERPETUATE ALBINO DEER

Up to the present time, the effort to perpetuate an albinistic strain has been largely confined to white mice and rats, white rabbits, and poultry, for in the larger animals this occasional recession from normal only results in the killing of such conspicuous objects, man and predatory animals being alike responsible. Moreover, when occasionally captured, it rarely happens a mate can be found of similar color.

This white phase is found in all organic life, as, for instance, elk, deer, porcupine (see page 121), beaver, muskrats, squirrels, many wild-fowl, robins, swallows, crows, blackbirds, woodcock, and in frogs, fish, insects, and several forms of plant life, due to the absence of pigment. This deficiency in coloring affects only the outer skin, the hair, or feathers, as well as the retina of the eyes and the hoofs of most quadrupeds. Partial albinism is frequent, and in New Brunswick I saw a number of deer splotched with white of various patterns, giving some of them a strikingly odd appearance.

The writer has been under the impression that the first offspring of albinos were usually white, and on and after the third generation uniformly so, following the rule in silver and black foxes. Several biologists, however, have contended that "albinism being a purely recessive character among mammals, albinos should breed true from the first." That this conclusion is sometimes a mistake was shown a year ago, when one of the white does bore a normally colored fawn, the white buck being the only male in the inclosure.

There are many nature lovers, vitally interested in the efforts of science to produce and perpetuate new variants of existing species, who will be gratified to know that as time goes on specimens of this new and beautiful phase of the white-tail may find representation in other parts of the country. The various members of this original albino colony are shown herein at different ages, in varied attitudes, and in contrasting seasons.

CHAPTER IX

MOOSE ON ST. IGNACE ISLAND

Diagonally opposite Marquette and on the north shore is an interesting and beautiful group of islands, the largest of which, St. Ignace, occupies the entrance to Nipigon Bay, into which flows the most famous of Canadian trout streams.

On a trip west of Port Arthur, in 1916, for the purpose of studying the moose along the international waters between Minnesota and Ontario, I was told that several of the larger islands near the Nipigon contained an incredible number of moose, but as at this point the line of the Canadian Pacific follows the shore, in sight of the islands, the report seemed somewhat doubtful. However, in the

Photograph by George Shiras, 3d

FLASHLIGHT OF A BEAVER TOWING A SAPLING, WHICH IS TO BE ADDED TO ITS STORE OF FOOD FOR WINTER

Unlike the muskrat, with its body well out of the water (see page 199), the beaver swims nearly submerged, with only the head showing (at the right). At a distance it is sometimes hard to tell one from the other when swimming, except by the greater speed and wake of the beaver.

following year it was decided to investigate, for except on Isle Royal, the largest island in the lake, the moose had not been authoritatively reported as island occupants.

It should be stated that for some years after the writer came to Lake Superior moose and white-tail deer were unknown on the north shore, although caribou were abundant, especially in the fall and winter.

MOOSE MIGRATED FROM QUEBEC

About 1885 a steady movement of the moose westerly from Quebec was observed and a slower easterly migration from northern Minnesota. Eventually these animals commingled and took possession of the entire shore, later extending into the interior until they reached the waters flowing into Hudson Bay.

Following the moose came the white-tail deer and many timber-wolves, when the caribou began yielding the possession of centuries.

After the construction of the railroad, extensive lumbering and many forest fires changed the face of the country, large clearings and a mixed vegetation succeeding dense evergreen forests, and to this change may be principally attributed the influx of new animals and birds.

Most of this land being unsuitable for settlement insures a permanent and widely extended range for many of the big-game animals suffering eviction in districts valuable for mining or agriculture.

In September, 1917, our party arrived at Rossport, a little fishing village between the railroad and a bay opposite Simpsons Island, next in size to St. Ignace. Here provisions and canoes were obtained, and a few hours later the little tug was on its way, the party alert to detect the first island moose, the pilot having given assurance that before reaching the camp site several would be seen.

MOOSE FOUND FEEDING IN THE LAKE

When passing through the broad channel separating the two larger islands, three moose were noted well out in the shallow water at the end of a long bay, the first time in my experience that any such game animal was found feeding in the waters of Lake Superior, which, by reason of its depth and temperature, contains little aquatic vegetation.

Along the winding shores was noted a great variety of second-growth trees particularly suitable as browsing material for the moose, such as poplar, cherry,

Photograph by George Shiras, 3d

PARENT AND YOUNG BEAVER EATING THE BARK OF A POPLAR LOG USED BY THE AUTHOR AS BAIT

Only once did more than one beaver appear on the negative. Here a small poplar log attracted the mother beaver and her youthful offspring.

birch, soft maple, mountain ash, and balsam, while interspersed the dense forests of spruce offered a safe retreat from the hunter and an excellent shelter in the winter, being the only tree never eaten by moose or deer in this region.

WATCHING FOR MOOSE AT THE SALT LICKS

However, the apparent abundance of arboreal food was misleading, for it was now seen from the boat that all the lower limbs of the trees referred to had been eaten or destroyed by the animals for some ten feet above the ground, accounting for the moose just seen in a shallow bay, where the temperature permitted an unusual growth of water plants (see page 163).

Unlike Grand Island, with its precipitous cliffs to the north, most of the exposed shore of St. Ignace Island was low, with many bays separated by narrow, rocky points offering suitable camping places, where reefs and shallow waters seemed favorable for the best of trout fishing, while inland were high, rounded hills approaching an altitude of fifteen hundred feet, besides several rocky ridges dividing the island into many basins filled with the purest water, ranging from ponds of an acre to a lake four miles long, totaling nearly fifty on an island eight miles by five in size.

The tents were pitched on a level bank in a well-sheltered grove, at the edge of which flowed a fine trout stream leading from the largest of the interior lakes (see page 157).

Although facing the widest portion of Lake Superior, it was our intention to spend most of the time looking for moose in near-by ponds, as well as watching for them at several natural salt licks in a deep valley behind the camp.

BIG MOOSE HERD LIVING ON WATER PLANTS

These licks were discovered by two members of the party fifteen years before, when a yacht in which they were cruising ran on a reef. While awaiting the assistance of a tug the island was visited, where numerous caribou tracks about muddy pools indicated the presence of salt springs. It was due to this rather ancient record that we expected to find the moose as successors to the caribou at these resorts, which calculation proved correct. What the camera captured is best told by some of the illustrations accompanying this article.

XUM

In a week one hundred and fifty moose were seen, all apparently depending upon water plants for support, the numerous ponds and lakes yielding a sufficiency, though often the animals were forced to feed in water well over their backs, as they dived out of sight in search of food (see page 162).

Only on the face of inaccessible cliffs was the vegetation undisturbed, and just how these animals survived the long winter, when the waters were closed, was a problem, though many of them may have crossed to the main shore and returned in the spring. In a patch of spruce were discovered two large pairs of interlocked moose antlers, where these animals, in the fierce rivalry of the mating season, had gone down in mutual defeat forever (see page 161).

At the time of our visit no one was living on any of these islands, but nearby inhabitants supplied themselves with moose meat regardless of the law, justifying it on account of war conditions. At a salt spring several hundred yards back of the camp I located the first blind, where it was disturbing to see a four-year-old bull moose lying dead within thirty yards, killed but a few hours before and abandoned by reason of our proximity. Here, festering in the sun, it soon drove away any of its surviving associates (see page 159).

MOOSE DIG A BASIN OF CLAY AT SALT SPRING

Several days later another blind was placed opposite one of the best natural licks I have ever seen, located a mile up the stream from the first. Here the moose during many years had dug out a large clay basin, into which trickled a salt spring from the adjoining bank, the mixture resembling liquid mortar.

Every time we passed the place one or two moose would leave hurriedly, but a trial in the daytime showed that the scent circled toward the lick, covering every approaching runway; so a flashlight and camera were set up, and on the night following a large cow moose took its own picture at a distance of fifteen feet. The analysis of this salt lick is given in the text beneath the picture (see page 164).

On several islands adjoining, the moose were numerous and tracks proved the presence of a considerable number of caribou. All these animals visited licks similar to those on St. Ignace. On the opening of the hunting season, the same fall, one party of five from Port Arthur killed their limit of five big bull moose on the first day of the hunt, the antlers ranging in spread from forty-eight to fifty-four inches. The question uppermost in the author's mind is whether any of the fine bulls pictured in this chapter furnished some of these trophies.

Just as the south shore has been almost depleted of its trout by taking them at the mouths of all the spawning streams during their fall migration, similar conditions now prevail on the north shore, while a worse habit of running the gill-nets to the beach, ostensibly set for lake trout and whitefish, results in taking all the speckled trout exceeding two pounds in weight, and soon only the Nipigon, always under rigid government supervision, will remain.

CHAPTER X

WILD LIFE IN AND ABOUT THE CAMP GARDEN, WHITEFISH LAKE

In a previous issue of this Magazine* reference was made to the large number of birds and animals visiting the clearing and log cabins of a wilderness camp; for such a place is often an oasis in a dense and monotonous forest, where sunshine, wild berries and seeds, shrubbery and ground vegetation, insects, and small rodents offer food or a trysting place to many a creature outlawed by man.

Mention, too, was made of smaller and less timid animals which came at night to the gardens and poultry yards of many a rural home, especially when there are thickets, swamps, or rocky ravines in the vicinity. The tenacity with which these refuges are occupied by certain wild animals in the midst of encroaching civilization is an interesting study in resourcefulness and adaptability, wherein reason plays a part quite as important as that of instinct.

For nearly thirty years my camp was occupied only in the fishing and hunting season, followed by intermittent or long

* See "Wild Animals That Took Their Pictures by Day and by Night," July, 1913.

periods of disuse. On returning, there was varied evidence of of many woodland visitors, for here, in a sunny spot, would be the daily dusting place of the grouse; everywhere were the hoof-prints of deer and occasionally the dog-like tracks of a skulking wolf, unafraid of a hunter's cabin when a fresh trail of a deer gave assurance of a long-absent owner.

There were door-sills and pork barrels gnawed by the saline-seeking porcupine; the broken branches of a mountain ash where Bruin leisurely pulled down red clusters of frost-sweetened berries; the tender saplings girdled by a varying hare; clover and dandelions cropped close by bulky woodchucks; the pungent odor of a skunk beneath the cabin floor, and tracks of the great blue heron, mink, muskrat, and the beaver on the sand-bars of the creek flowing through the camp lot.

Photograph from George Shiras, 3d

A BEAVER EYEING THE OUTFIT WITH SUSPICION

Sometimes the thread, as above, runs to the base of the tree, showing the beaver making a preliminary circle before starting to work; in other cases the thread is attached just below the cutting, picturing the animal erect (see page 178).

STUDIES IN ANIMAL PSYCHOLOGY

Perhaps the first night there would be a chorus of indignant owls within the glare of the camp-fire or the startled snort of an approaching deer. Then all would change. For the circling smoke, the heavy blows of the axe upon the hard-wood logs, human voices, and the telltale scent gave distant warning of the enemy's return.

Except for the twittering of the chipmunk, the tattoo of the woodpeckers, and the flight of cedar birds and bluejays across the clearing, or the scamperings of the white-footed mice upon the cabin floor, all the more timid birds and animals would disappear.

The difference between the time when there was neither a habitation nor a railroad within twenty miles (see page 124) and when a more accessible camp was enlarged and a caretaker continuously in charge affords one of the most interesting chapters in animal psychology within the writer's experience.

It might well be supposed the eviction of forest visitors was final when the place was occupied by day and night, with all the noise and bustle of a woodland home, for the chorus of barnyard fowls, the neighing of horses, the lowing and the tinkling bells of browsing cattle, the chug of an engine filling the garden tank, the circling smoke, and the glittering lights seen afar each night gave ample notice to every living thing that man had invaded their domain and intended to abide therein throughout the year.

THE CAMP BECOMES A RENDEZVOUS FOR FOREST FOLK

But just the contrary happened. The deer soon found that their ancient enemy preferred a camera to the gun, and, freed from the terror of prowling wolves, took

Photograph by George Shiras, 3d

A BEAVER (AT LEFT) FILLING IN THE SLUICEWAY OF THE OLD LOGGING DAM
(SEE PAGE 198)

After the sluiceway had been two-thirds filled with water-soaked logs and sticks, it was completed by intertwining bushes and water-grasses, with a stone or log to hold them down.

possession of swamps and near-by thickets. The grouse knew the fox and lynx were equally cautious, and nested contentedly at the edge of the clearing.

Robins, safe from hawks and owls, built numerous nests in the scattered balsam, finding angleworms and berries for their clamorous broods. The night-loving hare nibbled on the clover beneath the midday sun (see page 168); the muskrats had trails straight from the creek to the nearest carrot patch; porcupines chiseled the tender bark of many a sapling; once a beaver gnawed a half-grown ash by the boat-house and only retreated when the flashlight recorded a midnight visit (see page 167).

Raccoons knew when the corn was tender, and again the flashlight saved the crop; skunks dug holes beneath the stable floor and now and then picked up a belated fowl; a mink, grown tired of a diet of fish, took heavy toll of the snow-white ducks in the swimming-pool (see page 166); chipmunks found the little potatoes just the things for carrying off; cherry birds gladly changed from the wild to domestic fruit (see page 123), and all day long woodpeckers, nuthatches, catbirds, and jays picked at the suet hung conveniently near.

Humming-birds and butterflies flitted among the flowers, beneath which sat little green frogs sure of a meal (see page 174); the blue heron stalked at the edge of the stream (see page 169), and none ever had reason to regret a camp wedged in the mighty forest, except those seeking the lives of harmless creatures.

THE DEER AS MIDNIGHT VISITORS

The most interesting as well as the most destructive visitors were the deer, for as the gradually enlarging garden

Photograph by George Shiras, 3d

BEAVER WORKING ON SUBSTRUCTURE OF THE DAM THREE FEET BELOW THE SURFACE

This scene represents one of the many beavers that, for the past six years, have endeavored to fill in the sluiceway of the lumber dam above the author's Whitefish Lake camp (see page 198). This beaver fired the flashlight when he was several feet below the surface. Body takes white, oil on hair reflecting light. Note the hair separated in strands by the current.

offered a greater variety of vegetables and small fruits, the temptation proved irresistible.

When the garden patch was a simple one, and unguarded before the hunting season, the bucks were formerly active in these forays; but few came later, the gallantry of the mating season sometimes inducing an antlered escort to jump the fence over which had already gone his less timorous partner.

Does, fawns, and yearlings, totaling some seasons more than a dozen, each night or so registered their presence and respective ages by the clear-cut hoof-prints in the garden soil. Rarely did one come before midnight and seldom were any seen in the vicinity during the day.

In the past decade a record has been kept of the vegetables and fruits most preferred, with a notation when there was a marked departure any season by groups or individuals.

RASPBERRY BUSHES FIRST VISITED BY DEER

Not until the fawns were free to follow their mothers and the garden offered the first of the ripening crops would there be a visitor. On or about the middle of July the wild raspberry bushes close by the fence showed a clipping of the newer growth, followed by a nibbling on the tender bark of border fruit trees. A few days later, when the darkened windows gave assurance that the occupants had retired, the vegetable patches close by the cabins were visited.

In the order of choice, and somewhat determined by the rate of growth, came the carrot and beet tops, lettuce, and new shoots of domestic raspberries, white clover, peas, Brussels sprouts, and white

XUM

Photograph by George Shiras, 3d

A CONVENTIONAL HOME OF THE MUSKRAT

A type of house built by all muskrats in shallow, marshy waters throughout the country. This presents a view of the slough much frequented by deer (see page 127).

and red cabbage, the last mentioned, by reason of its sweetness, preferred above all else.

None ever touched the leaves or products of the potato plant, tomatoes, squash, rhubarb, corn, cucumbers, asparagus, onions, or parsnips, and the escape of the latter was inexplicable. Some seasons their attention was almost entirely devoted to the strawberry plants, and then the next year not a leaf or a tender runner would be touched.

FLASHLIGHT TEMPORARILY DETERS ANTLERED MARAUDERS

In the endeavor to save the cabbages, they were always planted within a few feet of the caretaker's bedroom; but often in the morning a great gaping hole in the center of a head showed what was considered the choicest morsel and willingness to take a chance.

Partly to save the crops and, in my own case, more to record the presence of the most cunning of our antlered animals, the flashlight and cameras were put in different parts of the garden, with a cabin or some camp shelter as a background when possible. More than fifty such pictures have been taken, a few of which accompany this article (see pp. 170-173). The heavy report and dazzling glare terrified each marauder for a week or two, and then, led by hungry and less timid fawns, they returned again to the feast, where on moonlight nights their shadowy forms might be seen moving noiselessly from place to place.

MUSKRATS MAKE A FORAY ON PARSNIPS

As another means of saving a portion of the crops intended for winter use, each on reaching maturity was placed in the root-house, except on one occasion the parsnips, which, never having been molested, were left in the ground, well covered with four or five feet of snow. It was the intention to dig them out early in the spring, when they would be in a better and sweeter condition than if placed in the root-house.

In the spring, as the deep snow began melting, a hole was dug down to the soil for a first meal on the parsnips, when a tunnel, with branches leading 200 feet to the water, made by muskrats, was found and not a vegetable remained! This showed very plainly the habits of these animals in venturing far from the watercourses and beneath the deep snows in search of green food untouched by frosts or zero weather.

SUMMER RESIDENT BIRDS ABOUT CAMP

In addition to the birds already mentioned within the camp inclosure and the

Photograph by George Shiras, 3d

IMITATING THE BEAVER HOUSE

A large muskrat house constructed entirely of sticks and mud, closely resembling in shape and material that of the beaver; south end of Whitefish Lake.

vicinity, a large number have been omitted which may now be noted in order to complete the record. No migrant passing to the north or returning in the fall is included, but only those found nesting or in company with young too immature to have crossed Lake Superior. Among the birds are the following:

The hooded merganser, mallard, black-duck, wood-duck, bittern, great blue heron, solitary sandpiper, spotted sandpiper, and killdeer; the hawks include Cooper's, the red-tailed, broad-winged, and the sparrow-hawk, and the owls are the barred and the western horned, both winter residents. Among the other birds are the black-billed cuckoo, belted kingfisher, hairy and downy woodpeckers, yellow-bellied sapsucker, northern pileated woodpecker, flicker, nighthawk, chimney swift, ruby-throated humming-bird, kingbird, phœbe, olive-sided flycatcher, wood pewee, alder flycatcher, least flycatcher, cowbird, meadow lark, bronzed grackle, purple finch, goldfinch; and the sparrows are the vesper, white-throated, chipping, field, song, and the Lincoln sparrow (doubtful), together with the slate-colored junco, the rose-breasted grosbeak, barn swallow, tree swallow, cedar waxwing (see page 123); and the warblers are the black and white, black-throated blue, myrtle, chestnut-sided, Blackburnian, and black-throated green warbler, the list concluding with the oven-bird, Grinnell's water thrush, house wren, white-breasted nuthatch, chickadee, olive-backed thrush and bluebird.*

CHAPTER XI

THE BEAVER AND THE MUSKRAT: A COMPARISON

Conspicuous among the few North American animals which have no representative in the Old World is the muskrat, its fossil remains being found in Pleistocene deposits in many parts of the United States, while the beaver belongs to a more remote time, its ancestors going back to the Tertiary period, when they were associated with the mastodons and mammoths throughout portions of Europe and Asia.

Considering the early importance of the beaver as a source of fur and food, and the respect shown its skill in constructing dams and houses, in cutting

*This list was verified by Mr. Norman Wood, field naturalist of the Michigan University Museum, who spent the spring and summer of 1918 at the author's camp.

Photograph by George Shiras, 3d

MUSKRAT HOUSE WITH A CORRIDOR

For five years, at least, a pair of muskrats have used this hollow log as an entrance to their winter home, which is rebuilt each fall on top of the log. A hole in the upper part provides an entrance (see also illustration on opposite page).

and storing its winter food, or wariness in avoiding the multitude of methods designed for its undoing, it is not strange that this animal figured in the tribal ceremonies of various Indian tribes and was exalted above other animals.

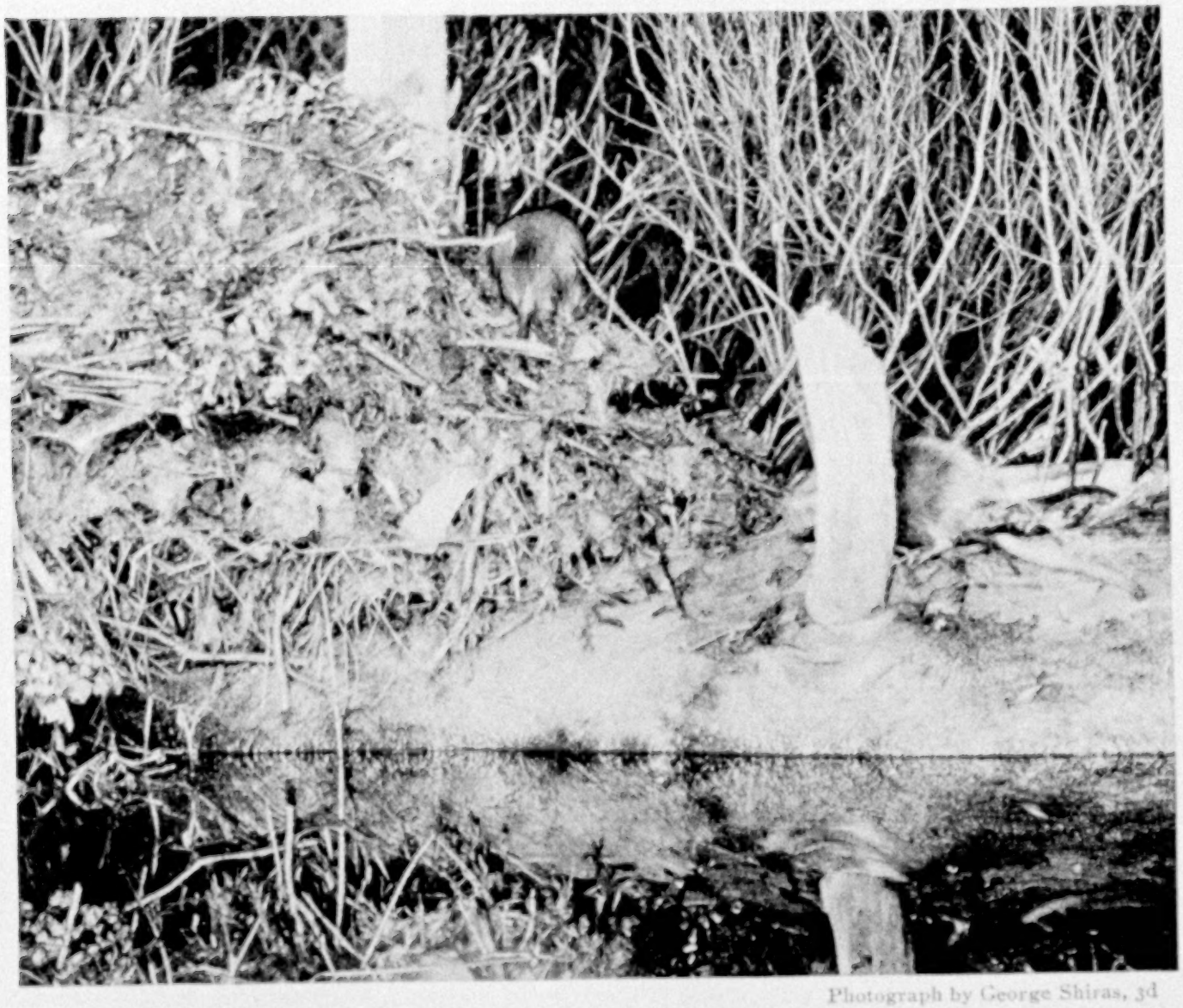
Both of these aquatic fur-bearers belong to the order of rodents, the beaver being the sole representative in the family *Castoridæ*, while the muskrat, once associated as a genus in the same family by Linnæus and others, has been demoted by later scientists and assigned to the rat and mouse family, the *Muridæ*, consisting of more than a thousand species and variants, widely distributed small animals, including many useless and destructive "varmints."

THE CINDERELLA AMONG FUR-BEARERS

To the properly descriptive prefix "musk" was appended the derogatory term "rat," making it a Cinderella among the fur-bearers and an outcast for many years in fashionable circles. With the gradual recognition of the high value of its fur, mostly under fictitious trade names, its caste has improved very greatly of late. Without entering into a discussion concerning the structural differences between the beaver and the muskrat, it is interesting to note their general resemblances in appearance and habits.

These animals are similar in shape and color, in the double coat of hair, webbed feet, flat, scaly tails, in having peculiar gland secretions and other anatomical resemblances. In habits they are homogeneous, being aquatic, nocturnal, monogamous, living in houses or burrows within the banks, each constructed and occupied in much the same way, often as harmonious cotenants, while their extensive range is the same in North America.

There is a marked similarity in the food habits of these animals. Very many



Photograph by George Shiras, 3d

A COMPLETED MUSKRAT HOUSE (SEE ALSO ILLUSTRATION ON OPPOSITE PAGE)

This flashlight shows the pair of muskrats putting the finishing touches to their home.

suppose that the beaver primarily depends on bark, and that such soft vegetation as it feeds upon is incidental and irregular. This is an error, for the beaver in its extensive ranges relies upon bark only during the months when other food cannot be easily obtained or stored.

By adaptation to the seasonal food supply, the beaver resorts to the more perishable aquatic growths from May to October, and to the many varieties of land plants, bushes, and vines, thereby conserving the arboreal supply for a time when the deciduous plants yield to the frosts or gradually chilling waters. In higher altitudes, where spring or glacial streams are often too cold for vegetation, the beaver depends upon bank willows, weeds, and the other small growths, though occasionally the bark of poplars or birch is eaten at the base, the tree seldom being cut before fall.

Prior to 1700 the beaver was seldom molested by the Indians of the upper lakes; for, aside from decorative purposes, they preferred larger skins for domestic use.

The early explorers found the usual meadows and alder-covered flats, where the original forests had been killed by the flooding caused by beaver dams; but, as the watercourses were fringed almost entirely with conifers, the lake region in the beginning was not a particularly good beaver country. When the aquatic plants, willows, alders, and black ash, constituting their principal diet, became exhausted, the animals migrated elsewhere, and thus these cycles of occupation and abandonment were regulated entirely by the question of food.

On the arrival of the trappers it did not take long to reduce these numerous but scattered colonies, and for a hundred

Photograph by George Shiras, 3d

MUSKRATS LIKE HOUSE-BOATS

A cedar raft built for the muskrats to use as a float for their winter home. Anchored in the slough at the south end of Whitefish Lake and now in use three years (see page 196).

and fifty years there was a succession of good seasons, followed by a relapse.

A NOTEWORTHY STUDY OF THE BEAVER

When the writer first came to Lake Superior not one stream in a dozen showed any recent signs of beaver, most of the animals being found at the headwaters of the streams and on little lakes well inland, where the Ojibways never lived and the white trapper sometimes overlooked them.

In 1867, three years before my arrival, there appeared in print a monograph on "The American Beaver and His Works," by L. H. Morgan, the most original and valuable biography ever written about this animal, and still regarded as a classic in zoölogic literature. Mr. Morgan resided in Marquette County for a number of years, associated in the building of railroads and furnaces. On his many trips into the woods he always employed Jack La Pete as his principal guide, and from the latter I learned much about this indefatigable investigator.

Mr. Morgan's collections of skulls and bones led us to nickname him "the fossil"; for, boy-like, we thought such relics savored of mental antiquity. It is now a pleasure to join in the public commemoration of this remarkable production and to be able to note the great changes taking place in the same localities he visited.

About 1885 the last beaver disappeared from the waters about camp, and for twenty years thereafter none was seen. Finally, a long closed season saved the remnant in upper Michigan.

Six years ago I found fresh cuttings and later located a beaver burrow deep within a bank at the south end of the lake. The next year in enlarging the chamber it broke through the surface soil, which was then covered with a mass of sticks.

HARD TIMES IN THE BEAVER WORLD

The same fall the eviction of the two-year-old beaver led to the establishment of a colony on the river not far above camp, where a large house was built of sticks and covered with mud (see page 180). This new home, however, was not finished until the middle of November, when the ice prevented the collection of the winter supply of food.

Photograph by George Shiras, 3d

BEYOND REACH OF WOLF, FOX, OR LYNX

A raft similar to that shown on the opposite page, anchored in ten feet of water, where it swings freely with the wind. These floating foundations permit the building of the superstructure a month earlier than where the animals are delayed through the fluctuating levels of the lake each fall. One raft house is built of moss, the other reeds.

The next year their plight was disclosed by the stumps of half a dozen black ash cut five feet above the ground, indicating the snow level at the time of their desperate harvesting. In the spring the melting of ice released and brought to the surface a large number of yellow lily roots, some of them six feet long, from which the tender shoots and the outer covering of the roots had been removed, indicating the beaver had passed beneath the ice-covered stream to the lake in search of food at a time when zero weather may have prevented forays above ground.

No lumbering having been done on the river and lake except the removal of a few large pines, there was an absence of all second growth, the beaver depending largely upon the long stretch of black ash bordering the river and parts of the lake. After the smaller trees had been cut, the remainder, varying from 40 to 90 inches in circumference, came next.

When the river colony was estimated to contain eight animals, there were two seasons, 1918 and 1919, during which from 25 to 30 trees were in the process of felling at the same time, showing that few, if any, of these animals continuously confined their efforts to a single tree until the work was finished. On an average it took from ten to fifteen days before large trees were felled, by reason of this intermittent cutting.

BEAVERS WERE NEVER SEEN IN DAYTIME

The beavers on the river were never seen in the daytime, for the narrow and shallow waters deterred such excursions, but on the lake it was not unusual to see some swimming about late in the afternoon.

It was some years before this, in October, 1912, and on a stream west of Marquette, I got a flashlight of a beaver repairing a dam which had been broken during the afternoon, for the purpose of getting a night picture as the animal attempted its repair (see page 177).

But those about camp had no dams, or at least were not permitted to block the river with one, and consequently the idea of taking a flashlight picture while a tree was being cut seemed to offer the best chance. For three weeks an outfit faced a half-cut tree without result. So, on departing for the East, I told John to leave the camera out a few days longer.

A night or two later a loud explosion was heard up the stream and the undeveloped plates were sent me with the hope

Photograph by George Shiras, 3d

FIRST COME FIRST SERVED

Here a pulling string connected with a flashlight and camera was baited with carrots and fish, for either muskrats or mink. The muskrat fired the flash first, and later a mink removed the fish, as shown by its tracks in the snow the next morning.

that a beaver would be found at work. This proved to be the case, giving much encouragement for continuation of the efforts the next season (see page 178).

While luck varied during the ensuing years, it was not long before I had a dozen or more pictures showing some of the animals erect, busy gnawing away, and others walking about at the base of a tree (see page 183).

PHOTOGRAPH SOLVES A PROBLEM

These photographs made possible the determination of the much-mooted question whether more than one beaver assists in the cutting of a tree. In not a single instance was more than one beaver shown at work or in the vicinity of the tree, nor was that tree touched again during the same season.

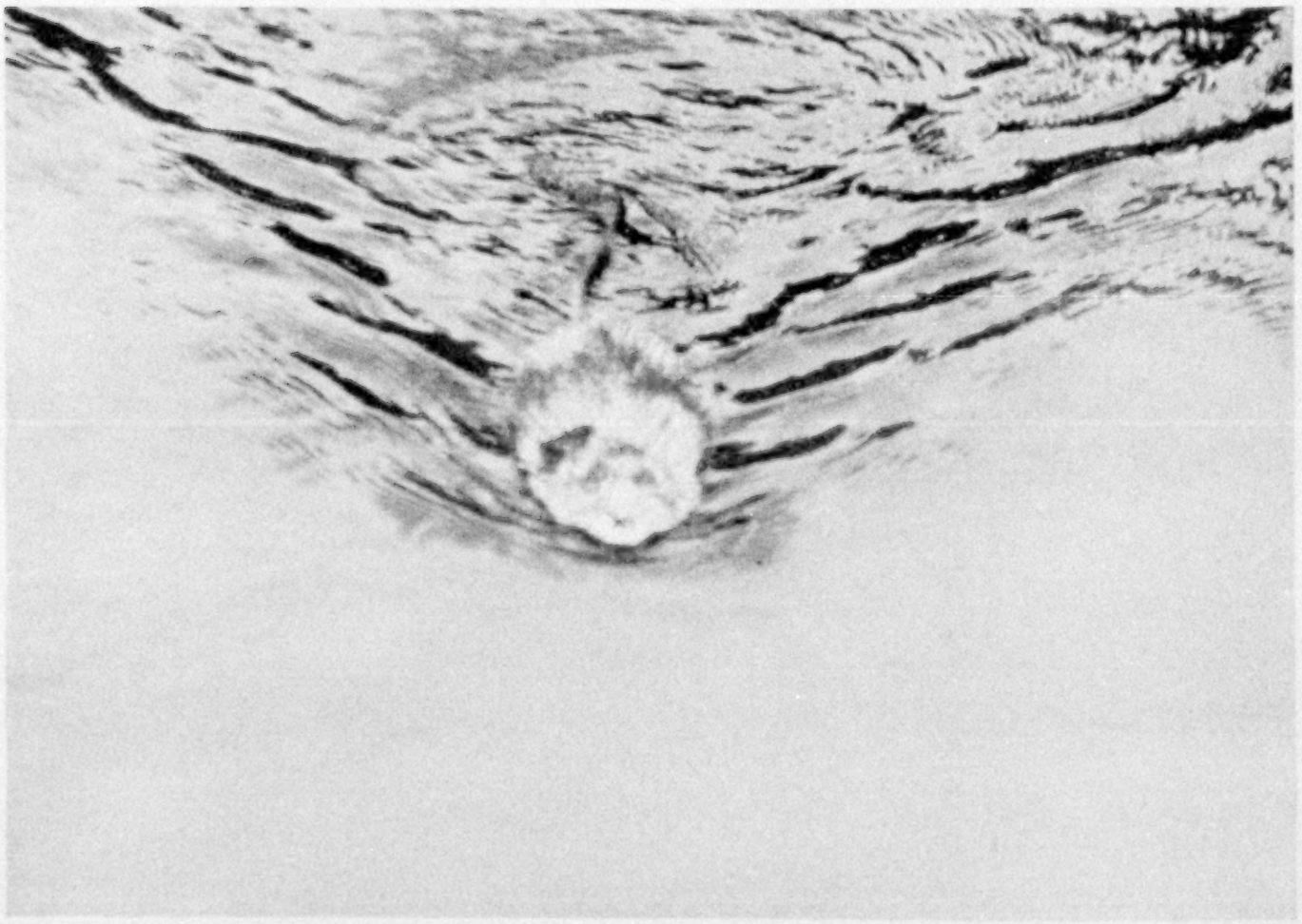
From the very beginning, the river colony tried every fall to block the sluiceway in an old lumber dam several hundred yards above camp by filling it with water-soaked logs and branches, the purpose being to flood the river bottom when cutting down the tree.

Each fall and to the present time it has been a case of "pull out in the morning and fill in at night." This effort to utilize the dam was a very practical conception, only it conflicted with prior rights at camp by preventing access to the lake (p. 190).

This almost daily removal of a great mass of sticks and brush caused John to figure on some way of discouraging their nightly activity, so a lighted lantern was placed in the middle of the dam, with the expectation that this would end their endeavors. The first night the plan was a success, but on the following one the animals were busier than ever. Then the lantern was lowered to the surface of the water, and they paid no attention to it whatever.

WATCHING THE BEAVER AT WORK AT NIGHT

Taking advantage of this situation, we visited the place at night to witness the beaver at work. Such a close view and under a strong light revealed perfectly their methods of construction; so a night later the flashlight and camera took our



Photograph by George Shiras, 3d

A MUSKRAT HEADED FOR THE CARROT PATCH (SEE PAGE 192)

The muskrat differs from the beaver by swimming with its body well above the surface. Contrast this photograph with that of the beaver on page 186.

place, in order that the scenes visible to a few might be put in a permanent and more available form (see page 177).

In 1919, after the beaver became abundant in a number of upper Michigan counties, the season was opened, resulting in all the trappers concentrating in these localities and in the rapid decline of the new-comers. A much better policy would have been the trapping alive any surplus and the distribution in those districts containing hundreds of thousands of acres of worthless second growths along the banks of streams and lakes where the beaver had not yet come.

Such a system, in a few years, would enlarge the beaver population to a point probably never reached in the region before; for the greatly increased food supply and well-balanced regulations in trapping would regulate and perpetuate a contribution of nature such as man never attempted before on such a suitable range.

The muskrat is much more versatile in the variety of its retreats than the beaver, possibly because of its smaller size. Often it takes possession of the overhanging and lower portions of a beaver-house, living there in peace with the larger landlord, or it may use the wing of any old lumber dam for an all-year home.

THE ABODES OF THE MUSKRAT ON WHITEFISH LAKE

The muskrats of Whitefish Lake have an unusual number of domiciles; for, in addition to those already mentioned, they resort to hollow logs with an entrance under water, or tunnel beneath a fallen trunk extending beyond the bank, this latter retreat being, I believe, a very common one.

One morning, on a Wyoming lake, I found a pair of muskrats asleep in a newly made nest of grass beneath a flat-bottom rowboat, where the bow extended above the water, and two succeeding nights the same thing happened. Such a home is easily constructed, besides being warm and secure.

The logs along the shore are often the

Photograph by George Shiras, 3d

MUCH ENGROSSED

Daylight picture of a muskrat on the edge of new ice, feeding upon moss taken from the bottom of the lake.

foundation of the superstructure, and in one instance the animal entered the hollow end and then, through a hole in the top of the log, reached the house (see page 194).

A MUSKRAT HOME ON A RAFT

Probably the strangest of all these homes are depicted on pages 196 and 197, where the animals used large rafts anchored in the lake and put there for that purpose by the writer.

Sometimes the house material used by the beaver and muskrat is completely reversed, for when reeds and moss are scarce the muskrat occasionally builds a house out of sticks and mud (see page 193), while the beaver, in a prairie country, has been known to construct its lodge entirely of aquatic vegetation, resembling that of the muskrat except for its size.

Both these animals are particular in having one or more entrances to their homes beneath the water, and when the water recedes the canals are deepened, so as to maintain subsurface approaches.

The muskrats of Whitefish Lake have a habit of building small houses out of moss on the ice-covered lake, using them as resting and feeding places when seeking water plants in the winter.

In many parts of its range the muskrat is supposed to raise from three to four litters a year. Along a great portion of the southern shore of Lake Superior I have never seen any evidence of more than one set of young a year. In this section occurs one of the deepest snowfalls of the country, and this unusual condition doubtless affects the muskrat.

About Whitefish Lake the waters remain cold and high until after the middle of May, when vegetation responds rapidly to the many hours of sunlight. The first young are seen the middle of July, and from that time on until the early frost or the coming of the ice I have never felt sure of having seen the young of a second litter.

THE EDIBILITY OF THE MUSKRAT

In recent years the flesh of the muskrat is becoming more and more esteemed. Its unfortunate surname—rat—has done more to excite a prejudice against its use than all the other causes combined, especially among the feminine members of the family.

Its meat is dark red in color, fine-grained and tender. According to the Biological Survey, any unfavorable opinion as to its flavor arises, probably, from

PORCUPINE AND VARYING HARE TAKING THEIR OWN PICTURES AT NIGHT

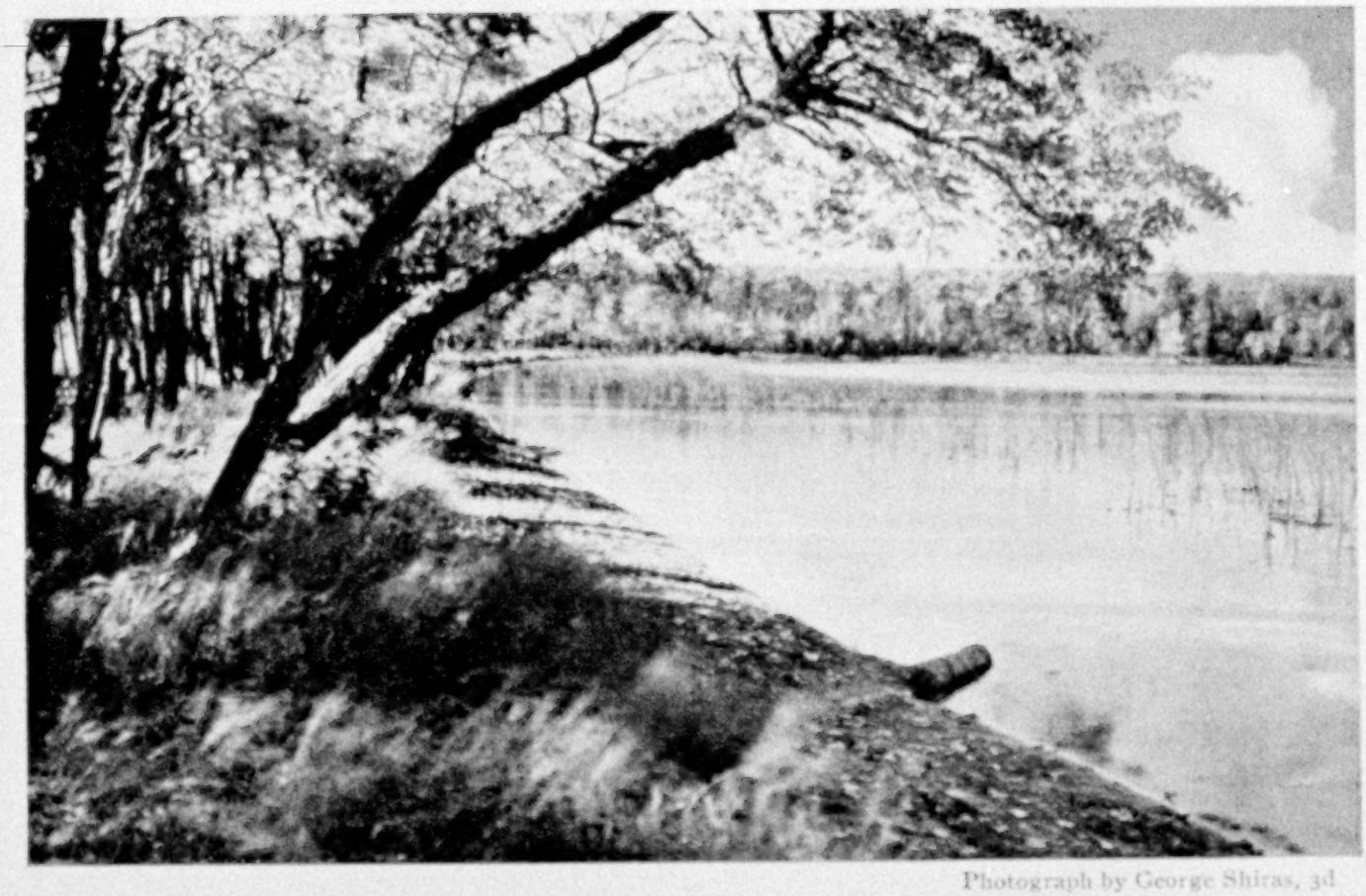
Rock-salt was placed between stones, to attract the deer. When the flash was fired, the developed plate showed in front a salt-loving porcupine, while in the rear is a varying hare, of similar taste, in the act of running into a string attached to the stake behind.

Photographs by George Shiras, 3d

DIFFERENT VISITORS ON THE FOLLOWING NIGHT: WHITEFISH LAKE

To prevent small animals firing the flash, as shown in the picture at the top of the page, a balsam top was placed over the salt, raising the string several feet, where it was not so noticeable in the mass of branches. Such contrasting and unsuspected scenes illustrate the fascinations of the automatic flashlight

XUM



Photograph by George Shiras, 3d

THE BANK ON THE LEFT, COVERED WITH SECOND-GROWTH TREES, IS AN ANCIENT BEAVER DAM 1,500 FEET LONG, PROBABLY 400 YEARS OLD, AND FORMING THE LAKE ORIGINALLY

The picture shows the western end of Echo Lake, which occupies a mile in the center of Grand Island. It is largely frequented by deer and elk.

the lack of skill in cooking or from carelessness in skinning the animal. It can be fried, roasted, or stewed, only having a slightly gamy flavor, which can be removed by soaking the meat over night in salt water.

I have found it comparable to tender chicken. For years it has been served, highly seasoned and flavored, under the name of "Maryland terrapin," without exciting any suspicion on the part of connoisseurs, who pay a fancy price for it. The use of a few terrapin bones in the dish when served has likely aided in this deception.

In some of the Eastern States the carcass brings from 30 to 40 cents, more than double the price once paid for its pelt. It seems unfortunate, therefore, that several million pounds of available food must go to waste annually; yet for many years its coat was rated among those of the humblest of fur-bearers, and at times the traders of the North refused to take them from the trappers, the skins being practically valueless in the market. In recent years the really beautiful fur of these animals has become more and more appreciated.

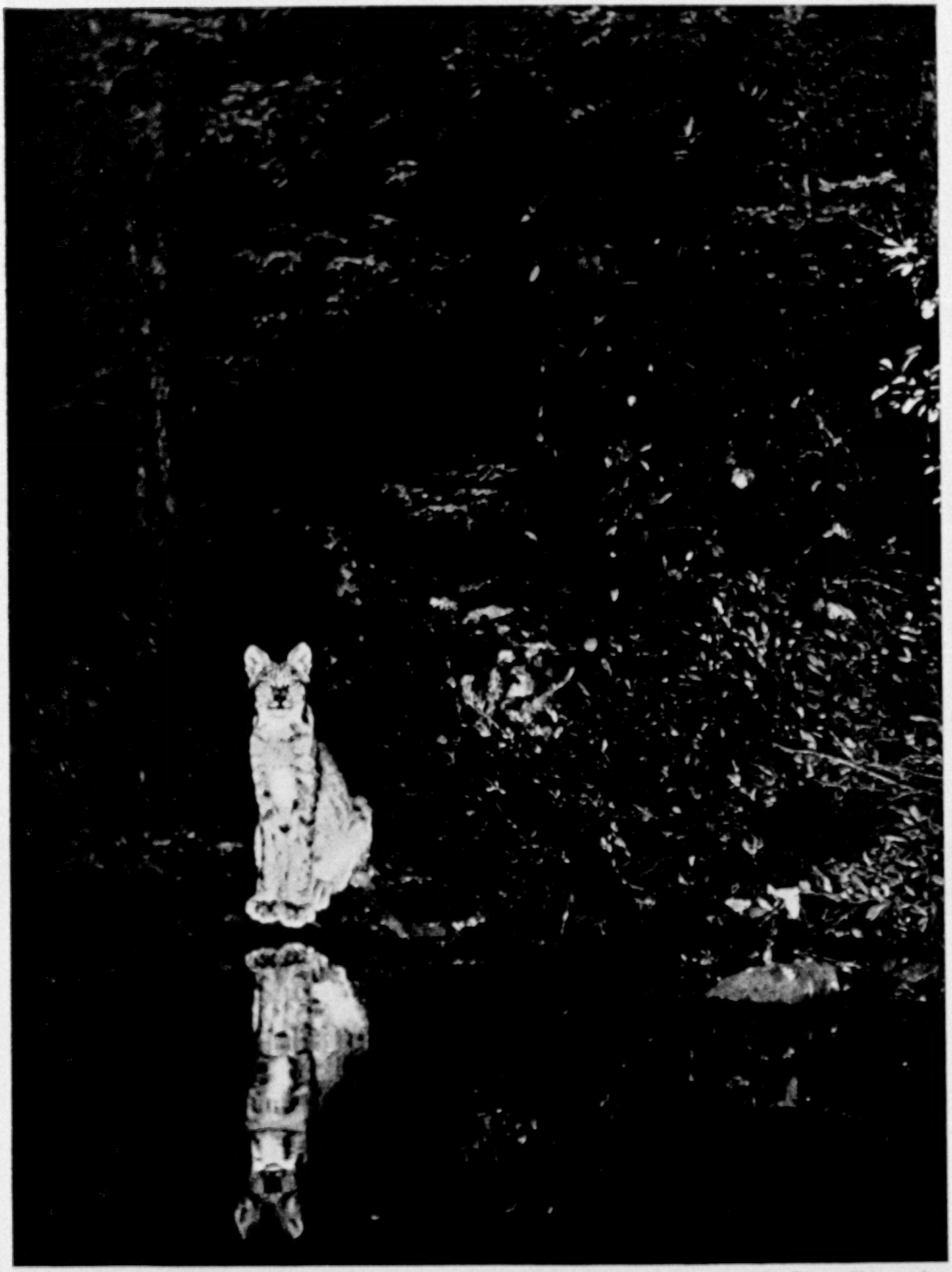
In 1920, at the crest of high prices, muskrat skins were sold in fur auctions up to a maximum price of $7.50 each. Today the muskrat, on account of the enormous number of its skins and their appreciated price, has become the most important of North American fur-bearers.

Thus it is apparent this American fur-bearer has reached the top in the total value of its pelts and in striking contrast to its status a few years ago.

Restore to it the old Indian name of musquash and the prejudice against the use of its fur or its flesh for food will rapidly disappear.

BIRDS AND ANIMALS MULTIPLY IN CUT-OVER AREAS

Partly because the subject has seldom been considered in print, and again because its significance is so little understood, the wonderful part that second-



Photograph by George Shiras, 3d

A UNIQUE NIGHT PICTURE OF A LYNX

This animal can seldom be photographed in the daytime and at night has a strong aversion to artificial light. In this instance, however, the subject sat erect on the edge of the bank watching the approaching jack-light, its reflection in the water doubling the image. Taken on a small lake in western Ontario.

growth vegetation in deforested areas plays in the distribution and relative numbers of birds and animals is worthy of further comment.

In the thousands of miles of wilderness surrounding Lake Superior, the present conditions, so far as Nature is concerned, are better for its wild life than before the coming of the white man, centuries ago; for there is a larger and greater variety of food and better shelter than ever before—two great factors in a suitable habitat.

Other factors of importance are the favorable climatic conditions which about Lake Superior are stabilized and devoid of extremes through the influence of the deeper waters of the lake which remain close to 39° throughout the year. The prevailing northwest winds of summer are cool and bracing, without rain or noticeable humidity, for the warmer and drier air ashore readily absorbs the moisture in the air from the lake, producing the exhilaration of high altitudes, free from the heart strain of a rarefied atmosphere.

Once unbroken evergreen forests covered much of the land. Back from the waters the tops of the towering pines and hemlocks, interlocking, excluded the warm rays of the sun and the bountiful dews; so that only a scant vegetation struggled in the perpetual shadows and in the sour soil, brown with the successive fall of needles.

In these primeval forests there was little food or shelter, for the giant trunks were almost limbless to the green canopy above. In the other sections, where hardwood forests predominated, conditions were equally unpropitious; for neither tender bark, leaves, nor budding branches were in reach of browsing animals.

In the early lumbering operations only the largest trees were cut, the removal hardly leaving a trace, and when one passed through this densely timbered land he seldom expected to see a living thing beyond, perhaps, a porcupine, a red squirrel, or a woodpecker drilling on a dying tree.

Finally came the period of intensive lumbering, where trees of every kind yielded to the axe or went down beneath the crash of a larger neighbor.

Many times came the warning from experienced hunters that the game was doomed; for the sight of cut-over land piled high with wreckage, the discarded limbs smothering all vegetation and discouraging any of a different kind, certainly gave color to these views. But in a few years fires or decay prepared the devastated areas for a new growth, giving assurance of better things.

Where once stood solid forests of pine, cedar, balsam, and hemlock, these were reproduced, the young trees, however, being low-branched and thick, blocking the driven snow and cutting winds, thus sheltering the game from the eye of man and putting food within easy reach.

LARGE CLEARINGS CREATED

Later came the removal of the matured hardwood maples, in hundreds of tracts of twenty to forty acres, creating clearings of unusual size, where the succeeding deciduous growths differed greatly from the original stock, consisting of rapidly growing trees like the poplar, white birch, cherry, alder, and mountain-ash, interspersed with a great variety of berries and low-growing plants, including clover and timothy, introduced by the wind-scattered fodder of many a logging team.

Here came the deer, rabbits, bears, grouse, and hundreds of berry- and insect-eating songsters, many of them new to the land, while the beaver took possession of streams and lakes bordered with these new growths.

In this region Nature, despite man's grasping ways, provides more abundantly than ever food and shelter for the birds and animals, and these bounties should be met in an appreciative way, making it possible for the wild life of the upper region to continue furnishing its valuable quota in meeting our necessities and in the gratification of our outdoor pleasures.

XUM

PROTECTING THE UNITED STATES FROM PLANT PESTS

By Charles Lester Marlatt

Chairman, Federal Horticultural Board, U. S. Department of Agriculture

With Photographs from the U. S. Department of Agriculture

Some ten years ago the National Geographic Magazine, *by the publication of an article on "pests and parasites," aided materially in securing the passage of a national law to prevent importation of insect-infested and diseased plants.* The accompanying article and the illustrations indicate the character of plant pests which are being intercepted by this law.*

PRIOR to 1912 there was no authority in law to protect the United States from the entry of new plant enemies or to control and prevent the distribution within the United States of any such enemies which may have gained limited foothold.

Not only could plants be imported by nursery and florist establishments without regard to their freedom from pests, but, in the absence of any protective legislation, America became a dumping ground for the plant refuse of other countries.

It was common practice of big nursery establishments abroad to consign, without order, tons of their culls to department stores, to florists, and even to auctioneers of this country, to be sold or given away by such stores or auctioned for what they would bring.

This freedom of entry, in the absence of authority for inspection or other insurance of freedom from insect pests and diseases, has resulted during the last century in the establishment in the United States of an enormous number of foreign plant pests which are, and will remain, a tremendous burden on the garden, field, and forest productions of this country.

THE FOOD BILL OF PLANT PESTS OF FOREIGN ORIGIN

Several years ago the Department of Agriculture issued a careful analysis of the losses caused to the principal crops of the United States by insect pests, showing that these losses amounted to upward of a billion dollars a year, a sum at that time more than sufficient to meet the entire cost of the administration of the Federal Government! That was under the old price of crops. Under recent prices these losses would approximate two billion dollars annually!†

These estimates relate solely to losses due to the insect pests and take no account of the losses due to such plant diseases as the grain rusts and smuts and the mildews, blights, and hundreds of other diseases affecting every important crop and also many forest trees and ornamentals. Such plant diseases probably occasion losses fully comparable to those due to insects.

These losses are caused by a host of pests, insect and fungous, that affect fruits, farm crops, and forest trees, *but more than 50 per cent of these losses are due to insect and diseases which have come to us from foreign lands.* Among these are some of the worst enemies of our principal crops.

Examples of such are the Hessian fly, the boll weevil of cotton, the alfalfa weevil, the Japanese beetle, the San José scale, and such plant diseases as the wheat smut, pine blister rust, citrus canker, potato wart, chestnut blight, and many others.

Altogether, these unwelcome immigrants, insects and diseases, include upward of 100 important plant enemies and

* Pests and Parasites: Why We Need a National Law to Prevent Importation of Insect-Infested and Diseased Plants. By Charles Lester Marlatt. National Geographic Magazine, April, 1911.

† The detailed discussion of these losses is published in the Year Book of the Department of Agriculture for 1904, and a later summary is given in the report of the Roosevelt National Conservation Commission.

DISINFECTION OF EGYPTIAN COTTON TO EXCLUDE THE PINK BOLLWORM

The worst of all cotton pests is the pink bollworm, the larva of a minute moth. The larvæ feed in the bolls and destroy the forming lint. This pest originated in India and reached Egypt about 15 years ago with some importations of cotton, and has since been distributed with Egyptian cotton seed to practically every cotton-producing country of the world. It reached Texas via Mexico in 1916, and since that time Congress has appropriated upward of $2,500,000 to be used in an effort to exterminate this pest.

This illustration shows the method of disinfecting Egyptian cotton. The entire row of cotton bales is carried at one time into a huge steel cylinder, shown at the end of the picture, by means of a movable platform. The cylinder then is hermetically closed and the air exhausted, creating a vacuum. The poisonous cyanide gas is then allowed to enter the cylinder, and the vacuum insures penetration of this gas to the very center of the bale, destroying all insects. This is the largest fumigating plant in the world, and each cylinder has a capacity of over 100 bales of cotton at one time.

A SPECIAL SENSE MUST BE DEVELOPED BY THE PLANT INSPECTOR

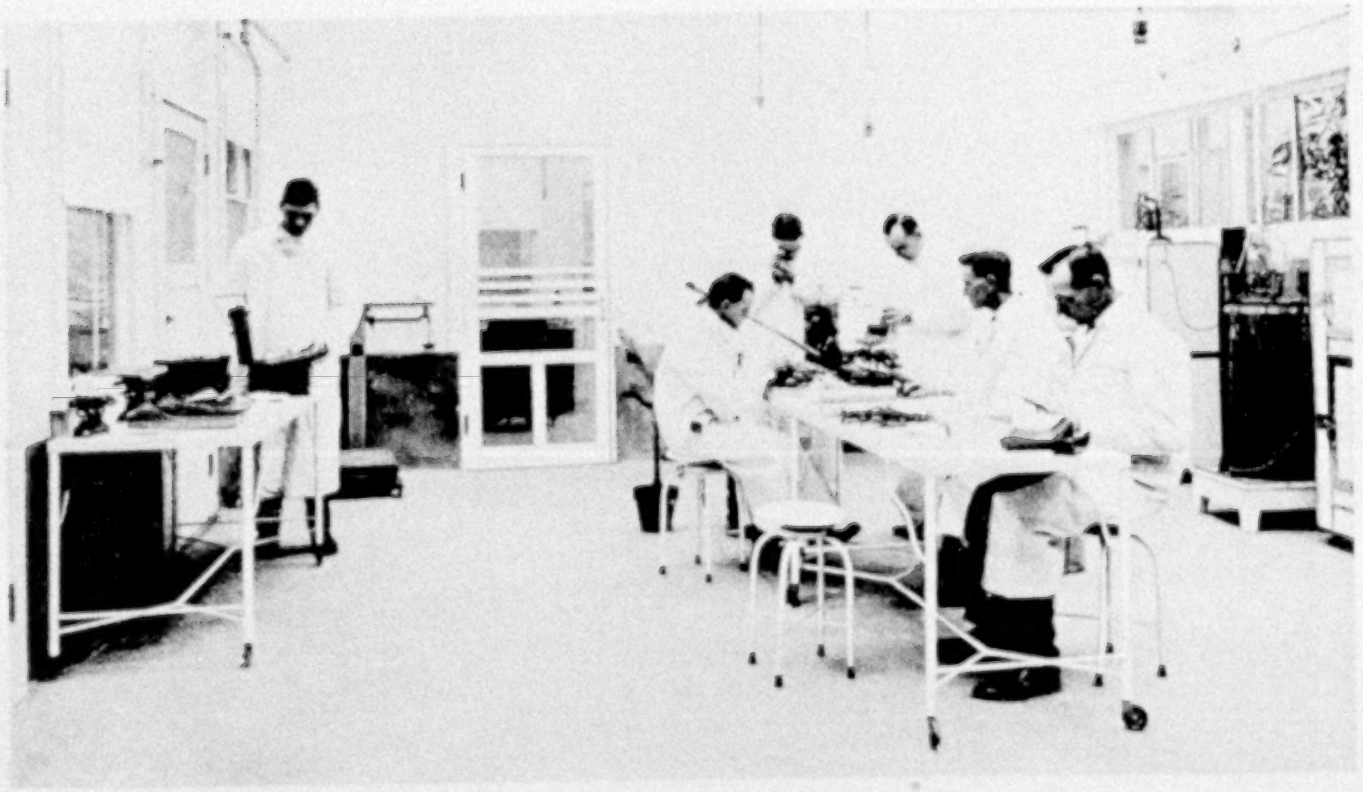
This photograph illustrates an effort to bring alligator pears into the United States from Mexico imbedded in partly baked loaves of bread, in violation of a Federal embargo on account of pests.

NATIVE POTATO WEEVILS FROM THE ANDEAN REGION OF SOUTH AMERICA

The Irish potato and the Indian corn are the two great food crops of the world of American origin. The potato is supposed to have come originally from South America. It is now discovered that in the Andean region this tuber is infested by a number of native weevils, which mine through the potatoes and render them worthless. It is a piece of tremendous good fortune to the world that the distribution of the potatoes has been from North America, where these weevils do not occur. Recent shipments of potatoes from the Andean region have resulted in the discovery of no less than four such weevils, one of which, with its work, is illustrated in the accompanying photograph.

COLLECTING JAPANESE BEETLES FOR WAGES

Boys earn modest wages by collecting Japanese beetles with nets in the heart of infested territory. The object is to reduce their numbers along roadways, so as to lessen the risk of their being carried by passing automobiles. The collected beetles are destroyed with oil.

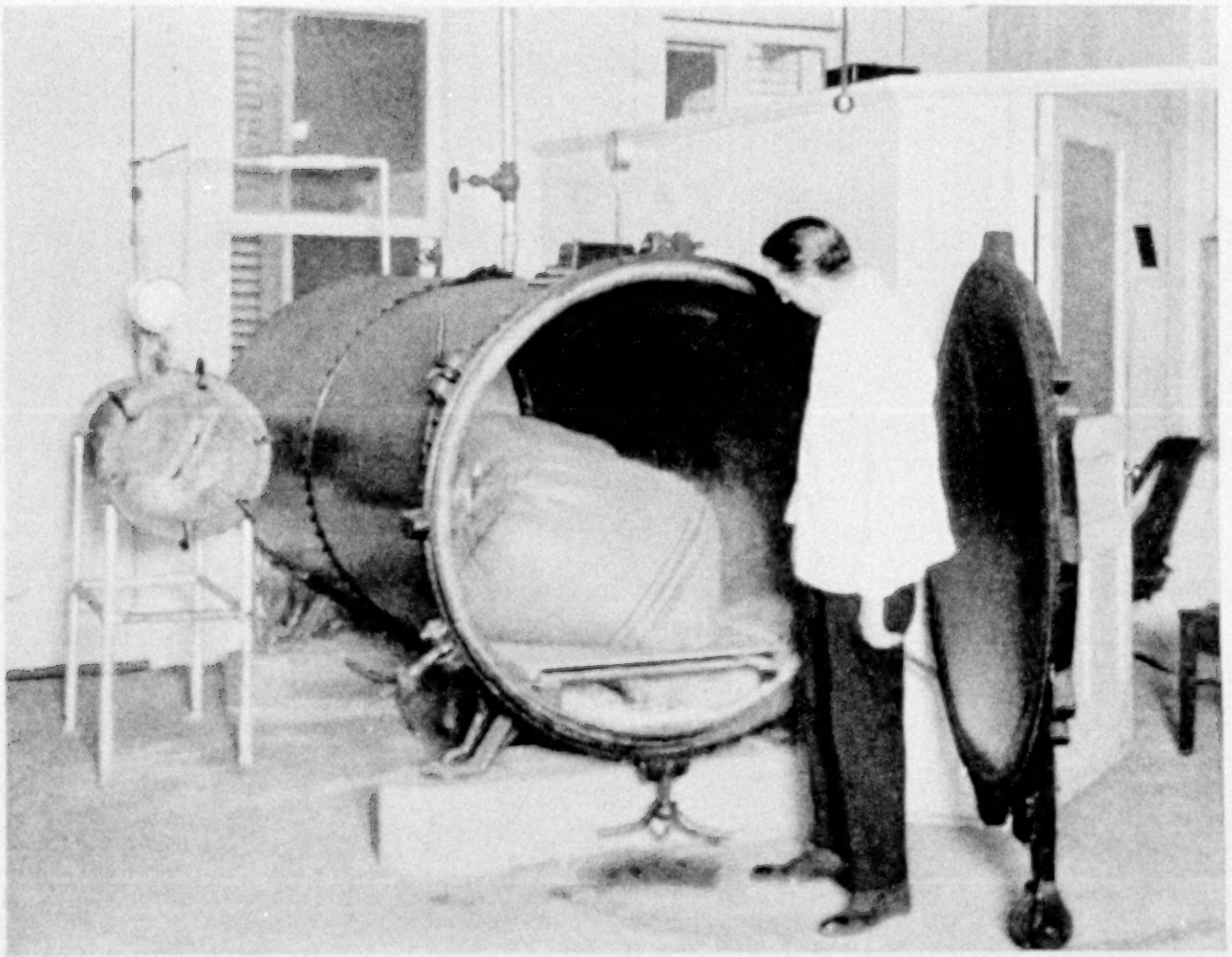


EXAMINING PLANT IMMIGRANTS TO SEE WHETHER THEY ARE HEALTHY

More than 10,000 naturalized plant citizens of the United States have been brought from every quarter of the world by plant explorers of the Department of Agriculture. All of these plants, as well as commercial importations, are carefully examined for injurious insects and plant diseases. If necessary, such plants are disinfected by fumigation, or destroyed if fumigation cannot be relied upon to eliminate any accompanying pests.

A SEARCH FOR FUNGI AND INSECTS AT A HORTICULTURAL "ELLIS ISLAND"

These lilies-of-the-valley roots may neither toil nor spin, but they require patient work on the part of experts from the Office of Plant Introduction to prevent the admission to the United States of undesirable parasites.



A BIG DRUM IN WHICH PLANTS ARE FUMIGATED

The inspection and disinfection to which plants imported by the Office of Plant Introduction of the Department of Agriculture are subjected has during the last year been extended to most of the commercial importations. The room shown in this illustration is equipped with a cylinder for fumigation under vacuum conditions, and with other disinfecting chambers and apparatus.

many hundreds of lesser importance, and their board and lodging, as just noted, costs this nation nearly a billion dollars annually.

THE COST OF SOME INDIVIDUAL LODGERS

The San José scale, which was introduced with flowering peach from China some 40 years ago, is now costing this country at least $10,000,000 a year for the spraying of orchards and in reduced output and value of fruit crops. Very conservatively estimated, this means an unnecessary food bill of $200,000,000 which we have paid out during these 40 years, upon the basis of one-half the annual charges for the last 20 years.

Similarly, citrus canker, introduced with Japanese trifoliate orange stock some 13 years ago, has cost in actual expenditures of Federal and State moneys in control work approximately $2,130,000, of which $1,273,000 were appropriated by Congress, and in value of orchards and nurseries which have been burned to the ground in the effort to exterminate this disease in Florida and other Gulf States, $11,063,000, or a total of $13,193,000!

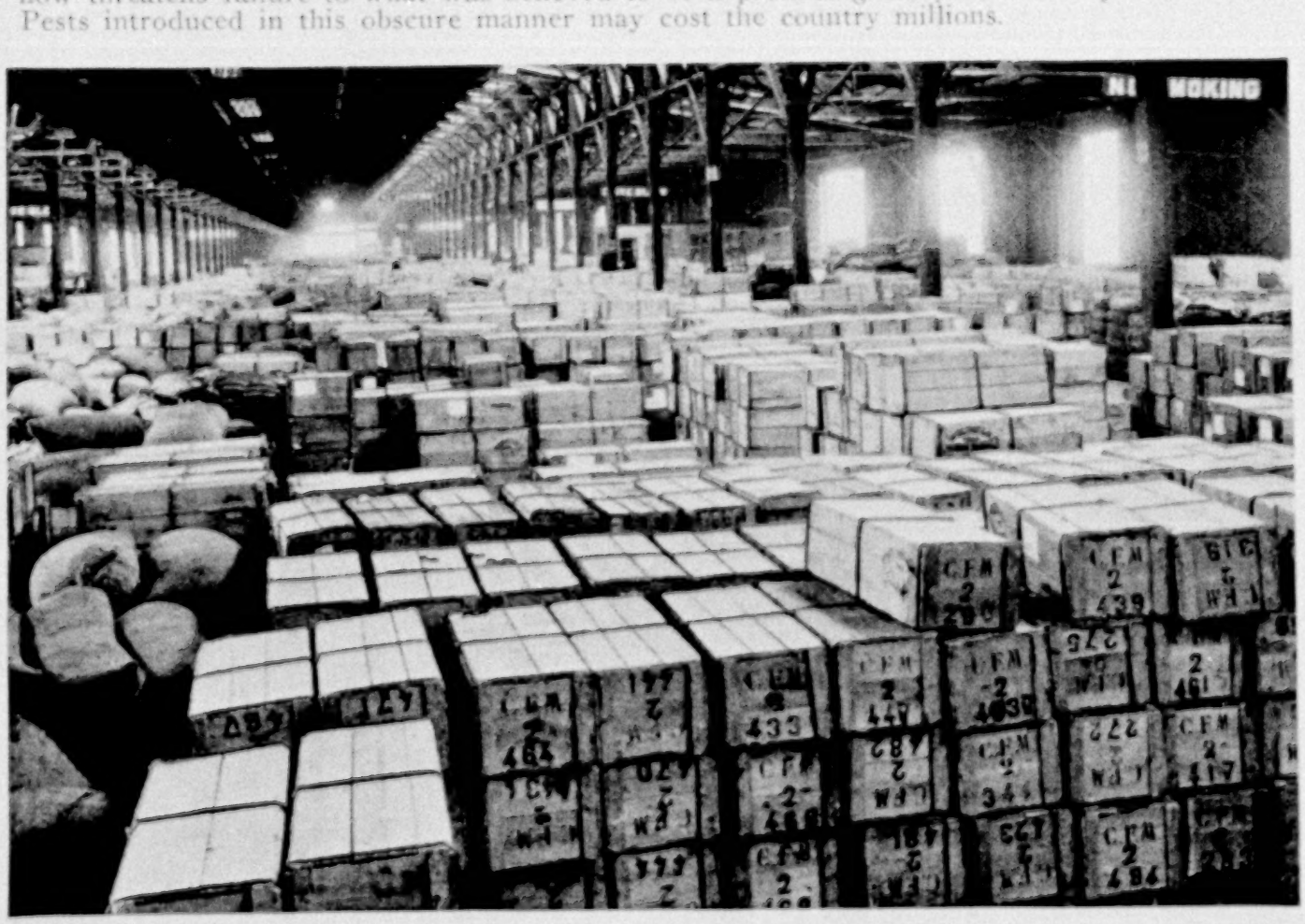
Furthermore, this estimate makes no account of the losses chargeable to reduced orange and other citrus crops on account of the disease and orchards destroyed. That is paying very dearly for a few plants of trivial value which in fact, easily and without risk, could have been grown from seed.

THE ORIENTAL FRUIT WORM CAME WITH THE JAPANESE CHERRY

The Oriental fruit worm, brought to this country with flowering Japanese cherries about 1911, when a widespread

THE LESSON OF A CRACK IN THE BARK

This bit of bark, to the unaided eye, had the appearance of any normal bark filled with numerous cracks; but many of these apparently harmless-looking cracks, when examined under a magnifying glass, proved to be filled with the eggs of a camphor thrips, a pest which now threatens failure to what was believed to be a promising camphor industry in Florida. Pests introduced in this obscure manner may cost the country millions.



EIGHTEEN MILLION NARCISSUS BULBS IN FIFTEEN THOUSAND CASES!

Unlimited importation is still permitted of the more popular bulbs, including narcissus, tulip, hyacinth, lily, and crocus. The photograph illustrates a single shipment of narcissus bulbs on the dock at New York awaiting distribution. There is still some risk of the entry of new pests, even with such clean bulbs, and it is hoped that the time may soon come when these bulbs will be produced in this country in sufficient quantities to meet home needs.

popular demand for this beautiful flowering tree developed, promises to be one of the most serious checks that has ever threatened our common deciduous fruits—peach, plum, prune, apple, pear, etc.

It is now firmly established in some half a dozen eastern States and probably has been even much more widely distributed through the agency of miscellaneous importations of flowering cherries, so that its ultimate spread throughout the United States cannot now be prevented. This insect is another serious pest introduced with ornamentals that will in a few years cause a continual annual charge to fruit production of millions of dollars.

The Japanese beetle is another new pest of wide range of food habit and likely to cause in the near future tremendous annual losses to all kinds of fruits, including not only apple, pear, and plum, etc., but also grape and small fruits. It not only destroys the foliage, but eats into the ripening fruit and renders it unsalable. It breeds in garden, lawn, and pasture lands as a soil-inhabiting white grub.

The evidence indicates conclusively that it was introduced about a decade ago in soil with an importation of Japanese Iris roots, and has now spread over a fairly large section of New Jersey and into contiguous portions of Pennsylvania. There is now no possibility of exterminating it, and its board bill will be a continuing charge, perhaps ranking ultimately with that of the San José scale.

The introduced diseases of forest trees, such as the pine blister rust, the chestnut blight, and the insect and disease enemies of the cereal and forage plants, are vastly more expensive lodgers than those just mentioned and, as already indicated, furnish the larger items making up the half billion to a billion dollar annual cost due to imported plant pests.

These undesirable immigrants we must lodge and board forever, but we want to shut the doors if we can to their brothers and sisters and cousins and aunts!

MANY OTHER PLANT ENEMIES TO BE EXCLUDED

These hundreds of foreign pests have become permanent factors in American agriculture and horticulture. They ought to have been kept out, and America would then have enjoyed a tremendous advantage over the old world; but late as the action was taken, it was still opportune.

SMUGGLING CONTRABAND "FRUIT"

A customs inspectress at Laredo, Texas, has taken a bag of alligator pears hidden in a woman's skirts. The smaller bag contained evidence of violation of the Volstead Act.

The Department of Agriculture recently compiled and published a catalogue of the more dangerous insect enemies of plants in foreign countries which for the most part have not yet gained entry into the United States. This catalogue was issued as a hand-book for the information of the plant quarantine inspectors, Federal and State.

In it are listed some 3,000 different foreign insect pests! These include insects injurious to forest and shade trees, to fruit and ornamental trees, and to the various farm and garden crops.

A similar manual, which is in course of preparation, lists the known foreign fungous diseases of plants, and will describe and catalogue, when completed,

XUM

ITALIAN BROOM-CORN INFESTED WITH CORN-BORER

It is now pretty well established that the European corn-borer reached this country through shipments of Italian and Austro-Hungarian broom-corn. This picture shows a shipment of Italian broom-corn which arrived at New York in February, 1920, and on examination proved to be infested with this dreaded European pest. All foreign broom-corn is now subjected to steam cooking as a condition of entry. This does not injure it for broom manufacture, but kills any harbored insects. The corn-borer illustrates the continuing risk of the entry of new pests with almost any sort of plant material, whether for manufacture or as packing for other articles of commerce, and indicates the breadth of the field which must be guarded if foreign plant pests are to be excluded (see next page).

probably as many diseases as there were insects included in the insect-pest catalogue.

Many of these insects and diseases are known to be as serious enemies as many of the worst of those already introduced.

These catalogues and lists will, however, enumerate only the known plant enemies. Most of the recent introductions from foreign lands of important pests have been of insects or diseases of which literature and available records gave us no warning.

Enormous areas in the old world have been little or not at all explored with respect to such plant enemies. This applies particularly to China, Africa, and even to much of Europe, and from these areas particularly have come pests like the San José scale, the Oriental fruit worm, the citrus canker, and the chestnut blight, none of which were recognized as important plant enemies prior to their importation and establishment in this country.

LIVING PLANTS COMMON CARRIERS OF NEW PESTS

Most of these introduced plant enemies have come to this country in connection with living plants and many of them with florist and ornamental stock. In many instances the imported ornamental or other plant has been a mere accidental carrier of the new enemy. For example,

the European alfalfa weevil, which is now largely reducing the output of alfalfa in half a dozen States in the middle West, was undoubtedly introduced with soil about imported plants. This weevil hibernates in the soil, and the only known means by which it could have reached the State of Utah, where it got its first foothold, is in soil with imported plants. Other weevils of foreign origin, affecting clover and other plants, have undoubtedly been similarly introduced. The Japanese beetle is a recent instance of such introductions.

The European earwig was also introduced in soil with imported plants and is perhaps an exception to the rule, in that it has been very troublesome to ornamentals in the highly developed estates of Newport, where it got its first foothold. It is notably a pest of garden and ornamental plants as well as a very obnoxious house pest and promises a very unsavory future record.

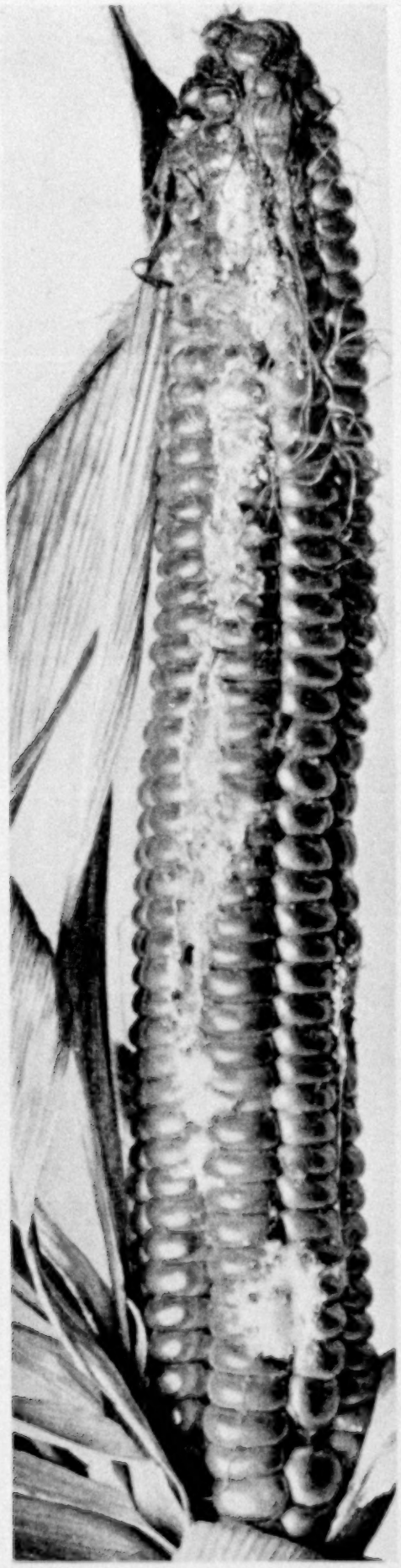
These instances are, perhaps, sufficient to illustrate the danger of bringing in pests with wide possibilities of damage more or less accidentally with ornamentals or other living plants.

Some of these foreign plant enemies have come in in other ways: The Hessian fly with straw; the Argentine ant possibly merely as a stowaway in the cargo of some ship coming to New Orleans; and the corn-borer with imported broom-corn. It is entirely possible, however, for both of the latter pests to be carried by living plants—the Argentine ant in soil and the corn-borer in any of the many ornamental plants which it is known freely to infest.

But looking over the record of these introductions, from early colonial times to the present, it is apparent that 90 per cent of these foreign pests have come in with living plant material of one sort or another.

FOREIGN COUNTRIES LONG PROTECTED

For some 30 or 40 years prior to 1912, when there was no authority in law to control plant importations into the United States, the more important exporting European nations which were finding free markets in this country for their plant products—wiser than we—to protect their own cultures, were prohibiting



THE WORK OF THE EUROPEAN CORN-BORER IN AN EAR OF FLINT CORN

This European pest was brought to the United States in 1908 or 1909 with importations of broom-corn, and gained footholds near Boston and in western New York and also in southern Ontario (see preceding page).

SOIL ABOUT PLANT ROOTS A COMMON MEANS OF ENTRY OF PESTS

Moist earth such as comes about many plants has been the source of entry of a host of our worst plant enemies, such as the Japanese beetle, the alfalfa weevil, and many others. No method of disinfecting such earth with poisons is possible without killing the plants. Moist earth is one of the best "gas masks," and many lives undoubtedly could have been saved in France if the soldiers, before the gas masks had been devised, had filled their handkerchiefs with moist soil and breathed through these at times of danger.

The photograph is of Japanese iris roots, and in the surrounding soil are the grubs of a pest unknown in the United States, related to the Japanese beetle. Needless to say, this entire shipment was destroyed.

entry of living plants from the United States. These prohibitions, first based on the grape phylloxera and later more widely extended on account of the San José scale, were usually absolute and therefore much more drastic than the ones now enforced under our own quarantine law.

For example, no living plants from America have for many years been permitted to enter France, Germany, or Holland, while similar or modified restrictions have been long enforced by other European countries.

A PROTECTIVE LAW FOR THE UNITED STATES

The need for national quarantine legislation for the protection of the farm, garden, and forest interests of this country from further invasions by foreign pests was long appreciated, but the securing of this legislation necessitated an extended period of earnest effort.

Toward the end of this period this legislation was hastened by the increasing numbers of gipsy and brown-tail moths found during the years 1909-12 on imported plants, and also by many other insects and plant diseases and by the need, which began to be generally appreciated, of excluding such other important pests as the Mediterranean fruit fly, the potato wart, and the white pine blister rust.

The movement was aided also by the experience with the chestnut blight and the San José scale. The entry of the citrus canker, the Japanese beetle, and

PROTECTING CUCURBITS FROM ATTACK BY MELON FLIES

No effective control of this pest is possible except to enclose the young fruits in a paper sack immediately after the bloom has been fertilized. The illustration shows this method as employed by Oriental market gardeners in Hawaii.

the European corn-borer all occurred during the last years of the effort to secure this legislation and before it was actually enacted, although the fact of the entry and establishment of these pests was not determined until several years later.

The Plant Quarantine Act of 1912 was the final outcome of this 14-year effort to secure authority to protect the United States, so far as possible, from further entry of plant pests. In connection with broad quarantine and regulatory powers, this act makes specific provision for the regulation of the entry of nursery stock and other plants.

ADEQUATE CONTROL BY INSPECTION AND CERTIFICATION PROVES IMPOSSIBLE

During the first seven years of the enforcement of the act an effort was made to prevent the entry of new plant pests by relying as safeguards on foreign inspection and certification. These were made in the countries of export by the most expert officials available, and as an additional safeguard provision was made for reinspection of these importations at destination in this country, either by Federal or by State inspectors. This reinspection has given us a fairly just appreciation of the continuing risk with the entry of such inspected and certified plants.

It is true that under this system, in which the best skill both abroad and at home was employed, much improvement was made in the health status of the imported plants, and infection was undoubtedly reduced to probably as near a minimum as is humanly possible.

The record, however, of the seven years of interceptions of plant pests in connection with imported plants indicates very clearly that in spite of these safeguards numbers of injurious insects and plant

LIVING WOOD-BORING WORMS IMPORTED AS "MEDICINE"

The plant quarantine service of the Department of Agriculture calls into coöperation many other departments of the government, such as the Post-Office, State, and Treasury Departments, etc. The larva shown in this photograph was one of a shipment from Japan invoiced as "medicine" and intercepted and turned over to the Federal inspectors by the postmaster at San Francisco.

diseases were being brought to the United States every year and with almost every considerable importation of plants.

These records are, furthermore, by no means complete, inasmuch as many of the States were unable to inspect all of the shipments at destination and, furthermore, no inspection, however expert, can be relied upon to discover and eliminate all instances of infestation or contagion.

Inasmuch as it has been urged that adequate inspection abroad would eliminate these dangers, it is, perhaps, opportune to introduce at this time a summary of the plant pests intercepted on such importations from the principal exporting countries of the world during these seven years.

INJURIOUS INSECTS INTERCEPTED IN RECENT YEARS

The countries made the subject of these records are those having the best and most expert inspection service and from which the plants coming to us have been in the best condition as to freedom from pests and general sanitation.

During this seven-year period, 1912-1919, there were received from Holland 1,051 infested shipments, involving 148 kinds of insect pests; from Belgium 1,306 infested shipments, involving 64 kinds of insects; from France 347 infested shipments, involving 89 kinds of insects; from England 154 infested shipments, involving 62 kinds of insects; from Japan 291 infested shipments, involving 108 kinds of insects, and from Germany 12 infested shipments, involving 15 kinds of insect pests.

As already indicated, these records are by no means necessarily complete, and, furthermore, in the instance of the State of New York, which receives the bulk of the foreign plant shipments, reports were made to the Department of Agriculture only of the most important findings. Many of these intercepted insects are not now known to be established anywhere in this country, and numbers of them, if established, would become important farm, garden, or forest pests.

Discussing briefly some of these inter-

ceptions, the European tussock moth, *Notolophus antigua*, an injurious forest and ornamental plant insect, was found in connection with no less than 67 different shipments of plants from Holland, involving some 16 different kinds of ornamental plants. Such important and easily detected pests as the gipsy and brown-tail moths were found respectively, in the egg and larval stages on no less than 63 different shipments of plants. These are merely typical illustrations out of many which could be afforded.

Practically all of these injurious insects which have been thus intercepted have been carried by the aërial portions of the plants and include few, if any, of the often more dangerous species hibernating in the soil about plants imported in balls of earth or in pots. It is not possible, without the destruction of the plants, to disintegrate and make an adequate examination of such soil, and no disinfection of such soil has proven possible without killing the plants.

THE JAPANESE BEETLE BREEDS IN THE SOIL

A spadeful of soil taken in a New Jersey meadow in the infested district is illustrated above. The eggs of the Japanese beetle are placed in the soil in pasture and other uncultivated lands during the summer, and the insect develops as a white grub, and later transforms into a pupa or chrysalis, and eventually into the mature beetle. The only method of reaching the weevil in the soil is by soaking it with powerful poisons—a very expensive and not altogether effective treatment.

PLANT DISEASES INTERCEPTED SINCE 1912

There is risk of entry through the medium of soil of a vast number of insects which, as elsewhere indicated, may have no relation to the plants imported, but may become important enemies of various field crops. The possibilities of such introductions of insects with soil are very large and are not theoretical, as indicated by the examples of such importations already given.

It is even more difficult to exclude plant diseases than it is insect pests, and in the case of many such diseases inspection is very often a safeguard of little importance. Many of these diseases are not discoverable by inspection or may develop to a visible stage only after a period of months or even years after the plants have been imported.

The pine blister rust, for example, cannot be determined often for five or six years, and other similar diseases may be in the tissues of the host plants and remain undiscoverable by any technical method except by planting and growth for a long period in quarantine.

With respect to the risk of introduction of dangerous diseases from Europe, it is significant that of the three serious diseases of forest trees that have been introduced into this country in recent years, two of them—the white pine blister rust and the European poplar canker—have come from Europe, where both of these diseases are well known, and in spite of the protection of Euro-

pean inspection service. The chestnut blight and the citrus canker similarly came from Japan, but in the case of these diseases no recognition of them had been made prior to their gaining foothold in this country.

INADEQUACY OF SPECIAL QUARANTINES

To prevent the entry of plant pests, quarantines and restrictions have been applied under the Plant Quarantine Act to all important dangers as they appear, and in this piecemeal fashion some twenty-two restrictive orders and quarantines are now in force against foreign plants and plant products. Such piecemeal action can be taken, however, only when the enemy is known, and gives no security against such unknown or unanticipated enemies as the San José scale, the Oriental peach moth, the Japanese beetle, the chestnut blight, and the citrus canker.

After having studied this subject, as indicated, for many years and after having given earnest consideration and a practical test of the possible alternatives of inspection and disinfection of plant imports, the experts of the Department of Agriculture and of the several States reached the conclusion that the only possible solution of this problem, which was constantly becoming more serious with the widening of commerce, is the policy of practical exclusion of all plant stock not absolutely essential to the horticultural, floricultural, and forestry needs of the United States. The existing control of plant importations is based on this principle. It is perfectly evident that no other system will give adequate protection to the great plant interests of this country.

ANY NEEDED PLANTS MAY BE IMPORTED

Ample provision has been made for the importation into the United States of any plant whatsoever, whether for introduction, experimentation, scientific, or other purpose.

In other words, no plants are absolutely denied entry into the United States under this or any other Federal quarantine, nor does the Department wish or intend now or at any time to make it impossible to secure new or old plants for which any reasonable introduction need can be indicated.

In addition to the provision in the quarantine for unlimited importation of certain classes of plants which are deemed essential to the horticulture and floriculture of this country, some 650 permits have been issued for the other, or so-called "prohibited, plants," for the purpose of establishing new plant-propagating enterprises which shall in a reasonable time supply our future needs.

Under these permits, entry has been authorized of upward of 16,000,000 of these so-called "prohibited plants," involving approximately 5,000 different kinds of plants. These importations are now being propagated and reproduced in hundreds of establishments in some 25 different States.

TRYING TO LESSEN RISK

It is the intention of the Department to continue to permit such entry of any necessary plant for the purpose indicated, to eliminate as soon as possible dependency on foreign countries, and thus attain the main purpose of the quarantine, in greatly lessening the risk of entry of new plant pests.

The existing restrictions on the entry of plants have been modified several times, and are subject to future modification upon presentation of adequate reasons therefor, and when such action can be taken without opening dangers which the quarantine is designed to guard against.

It would certainly seem to be good business and practical common sense to restrict as far as possible importations of plants which in the past have proven so disastrous to the agriculture and horticulture of this country. It is certainly unthinkable that the farm and garden and orchard and forestry interests of the United States or that any plant lover should want to return to the old system.

The plant life of America merits the same protection that is given to animals and man to ward off foreign scourges.

If the average American knew as much of plant diseases as he does of human and animal diseases, the necessity of a quarantine against infected plants would not need to be sustained by argument.

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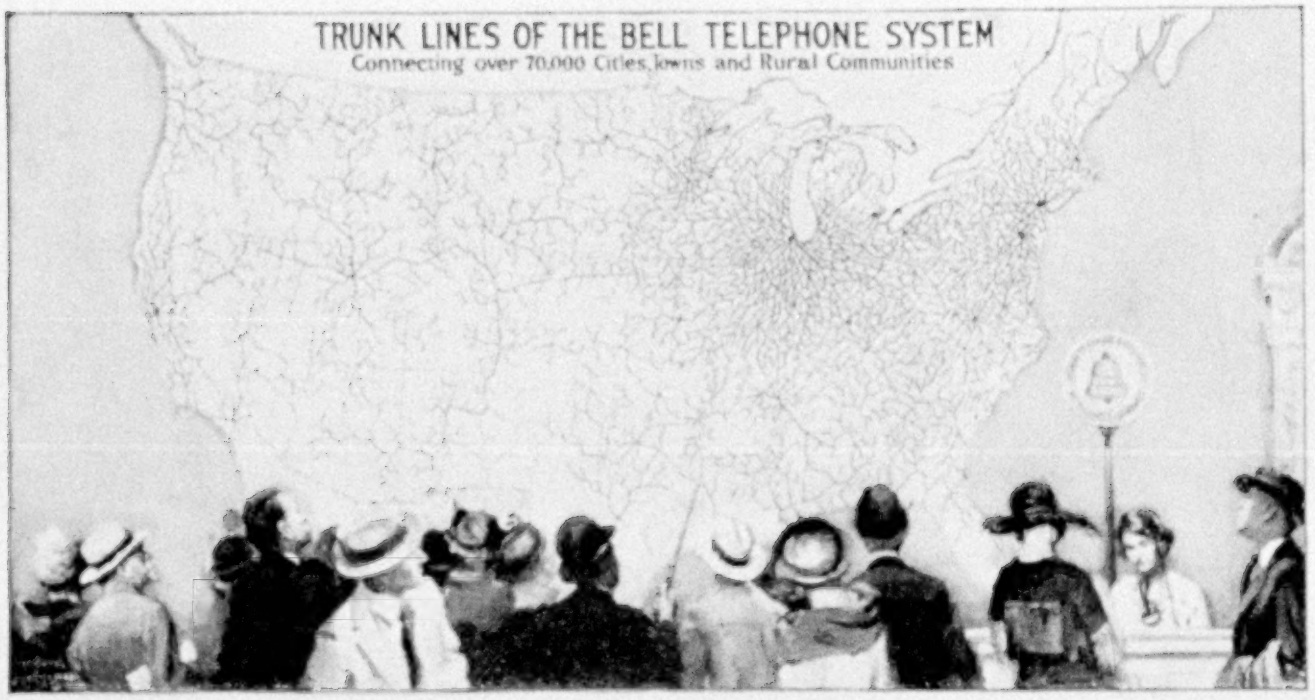

UNITED STATES	
Population	107,100,000
Square Miles	3,027,000
Number of Post Offices	52,600
Miles of Railway (1916)	250,000
Passengers carried	1,191,000,000

BELL SYSTEM	
Telephones owned and affiliated	12,600,000
Miles of wire owned	25,400,000
Number of Employees	270,000
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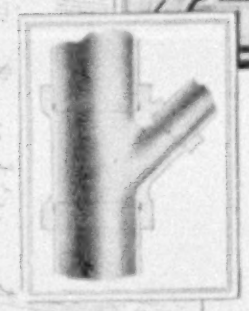

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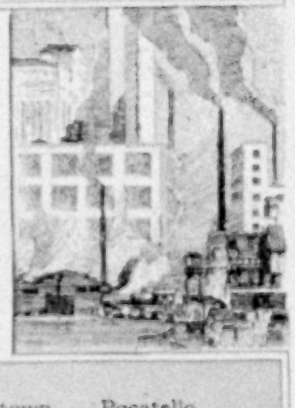

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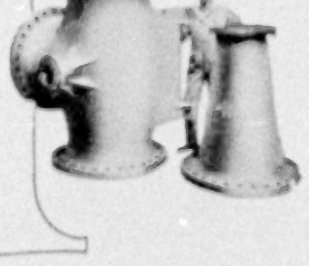

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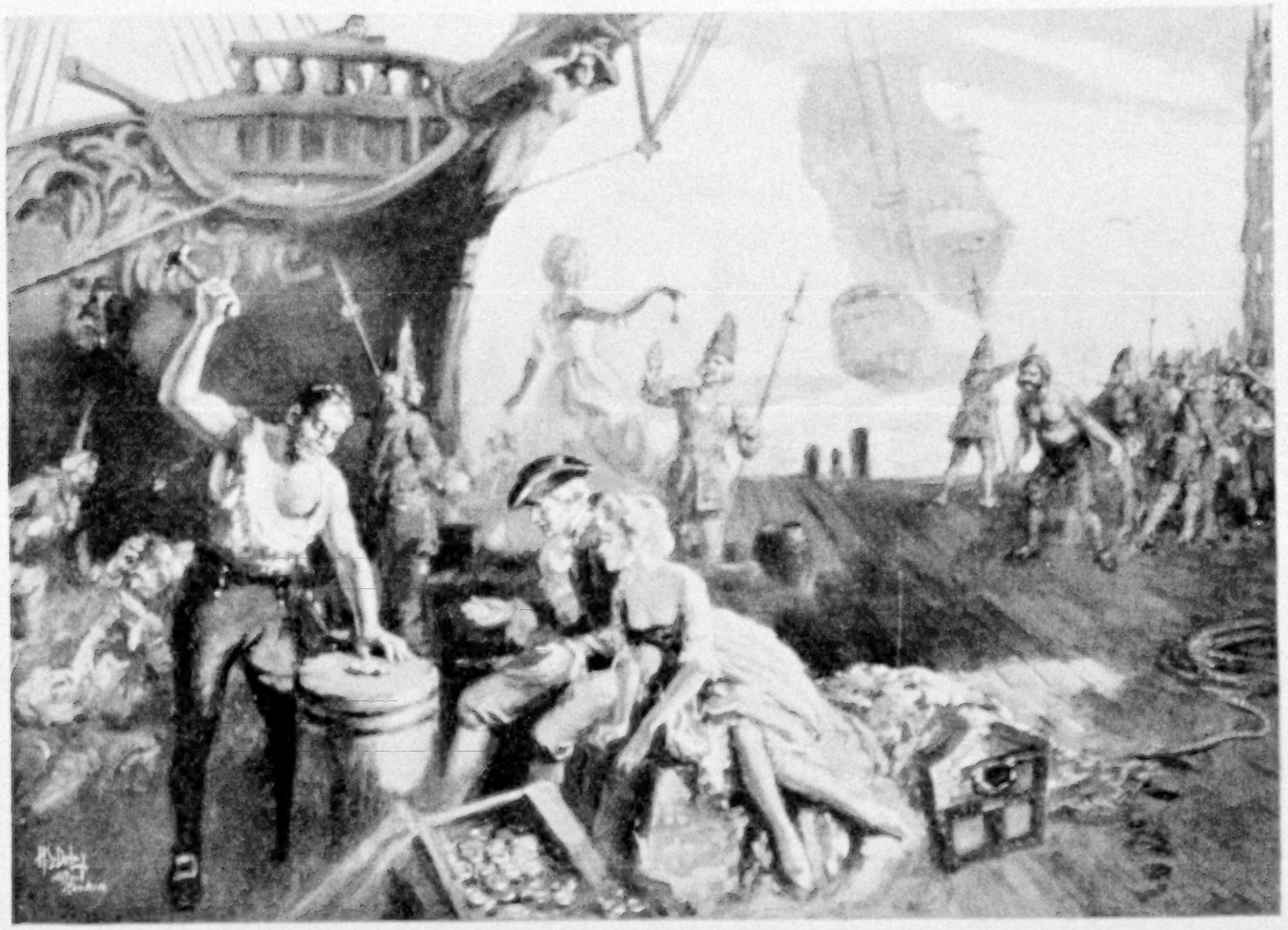

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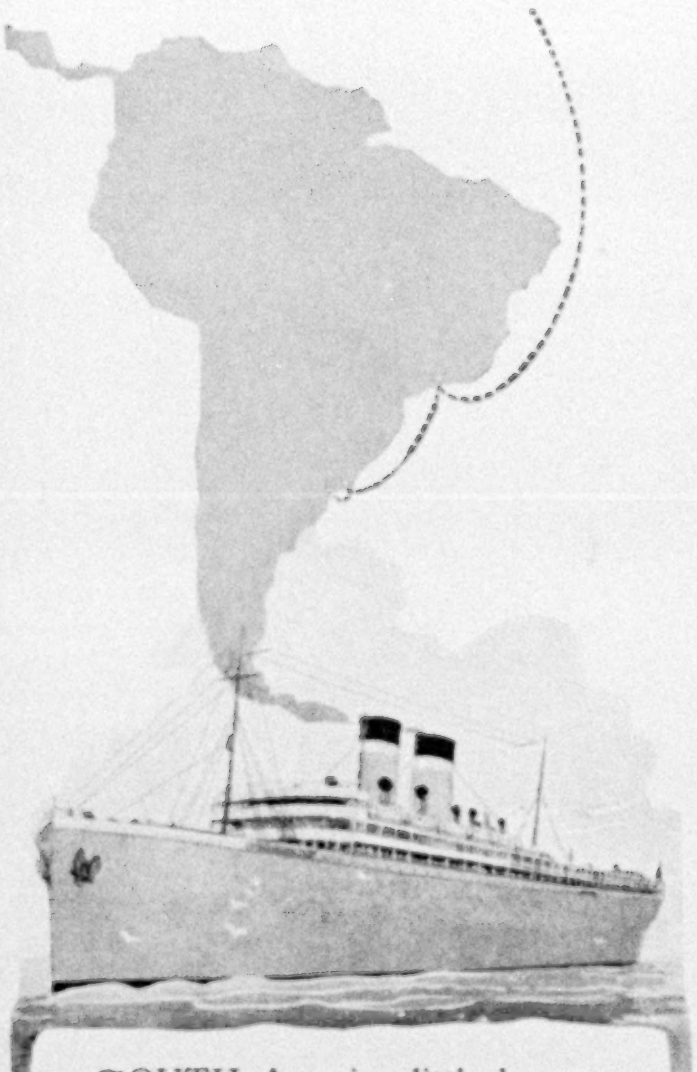

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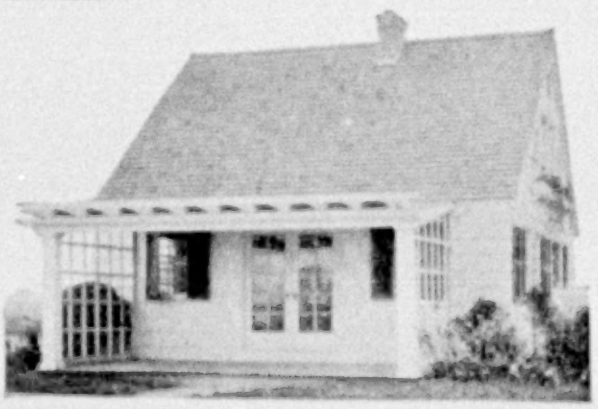

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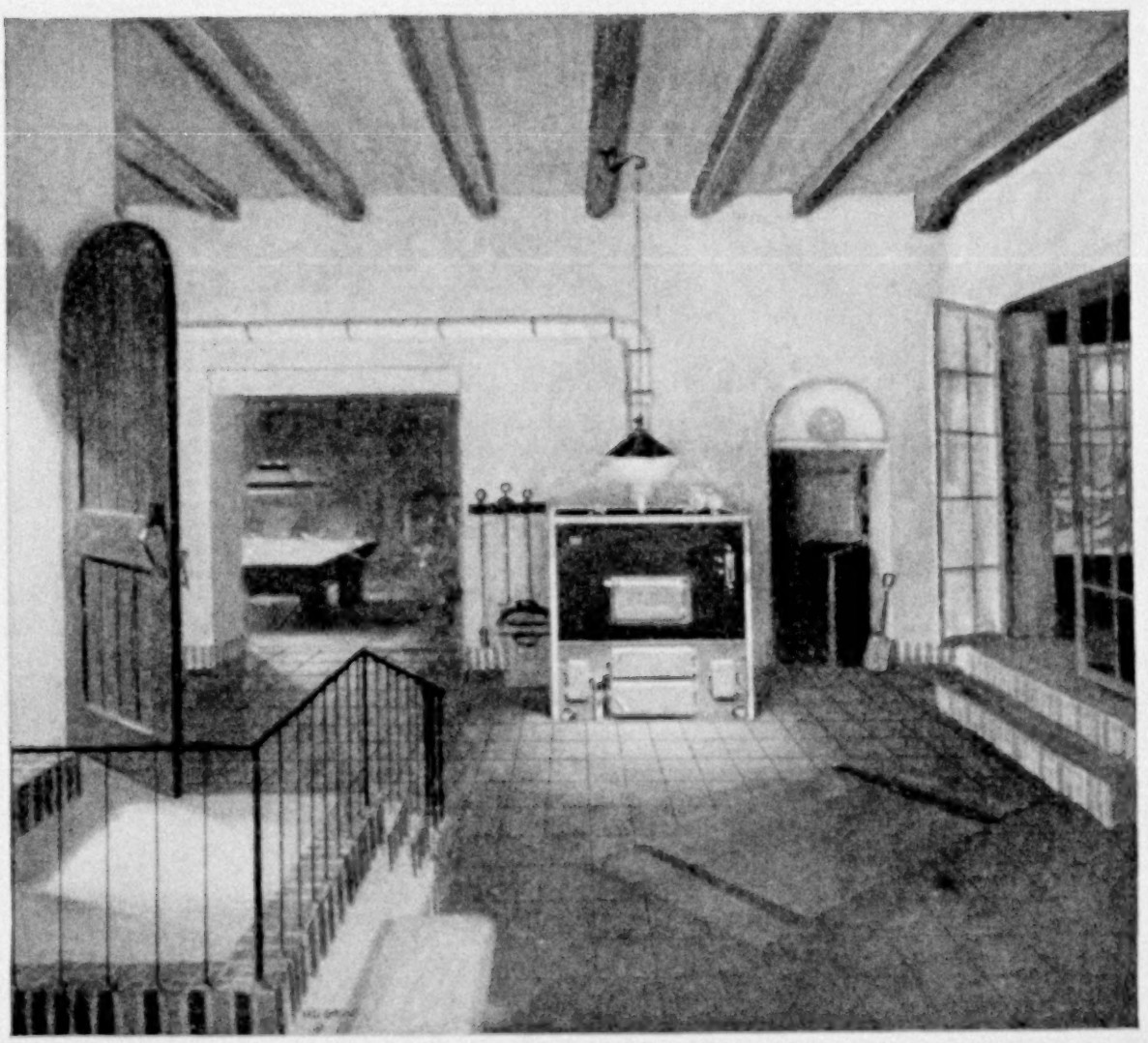

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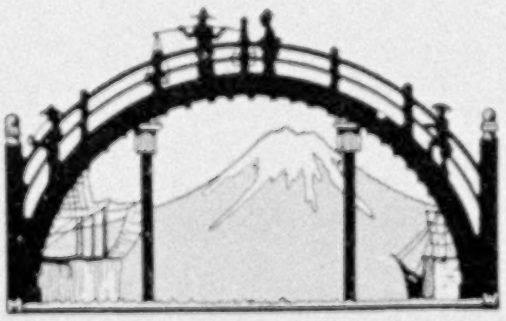

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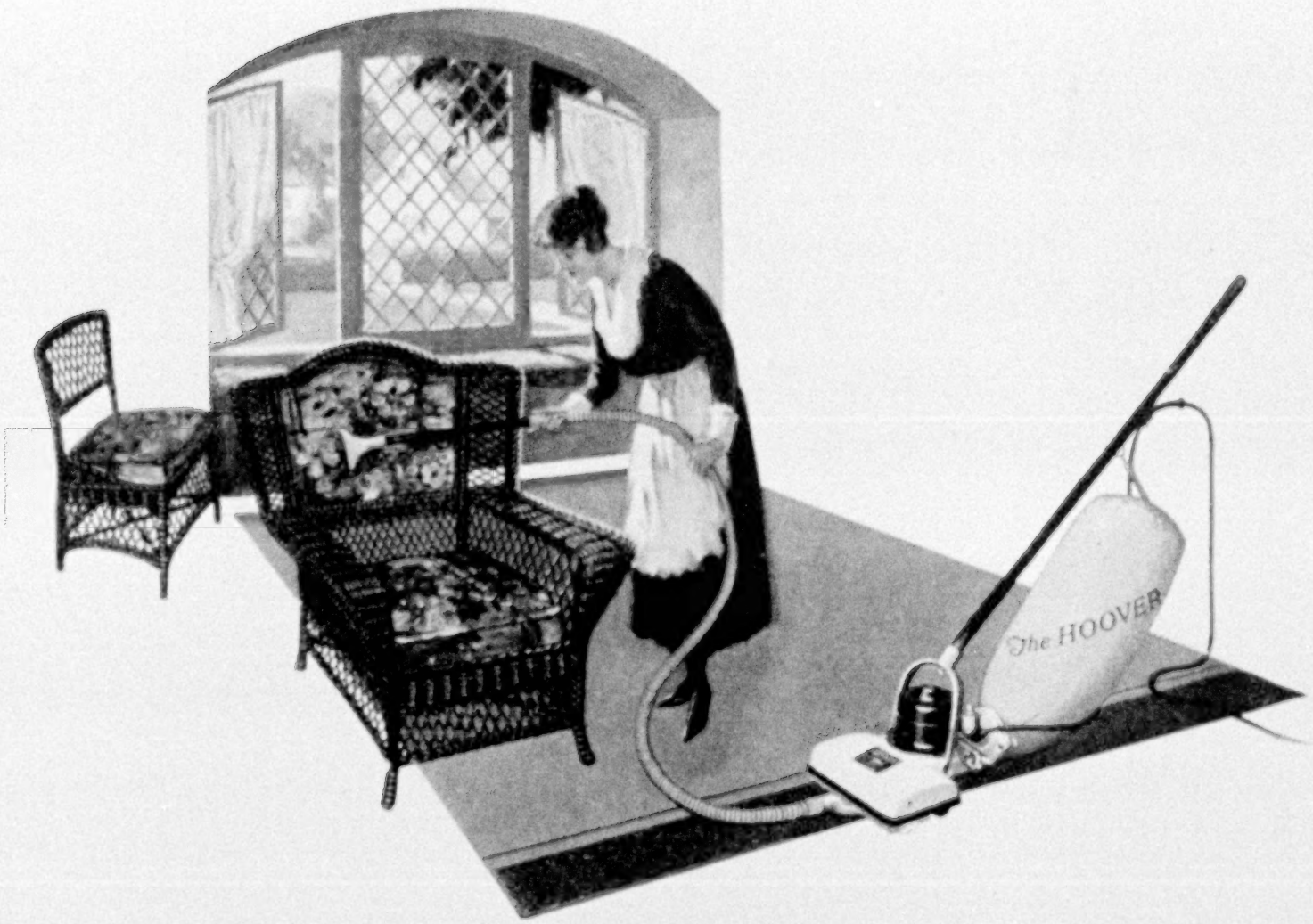

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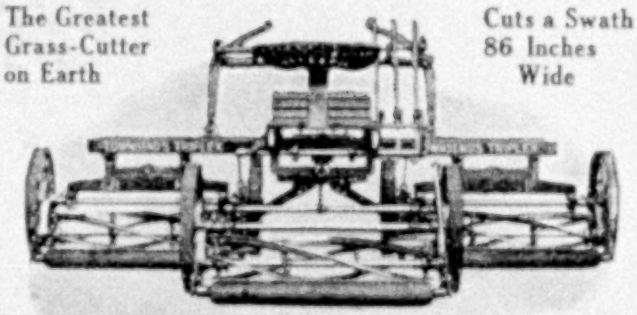

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One mower may be climbing a knoll, the second skimming a level, and the third paring a hollow. Drawn by one horse and operated by one man, the TRIPLEX will mow more lawn in a day than the best motor mower ever made; cut it better and at a fraction of the cost.

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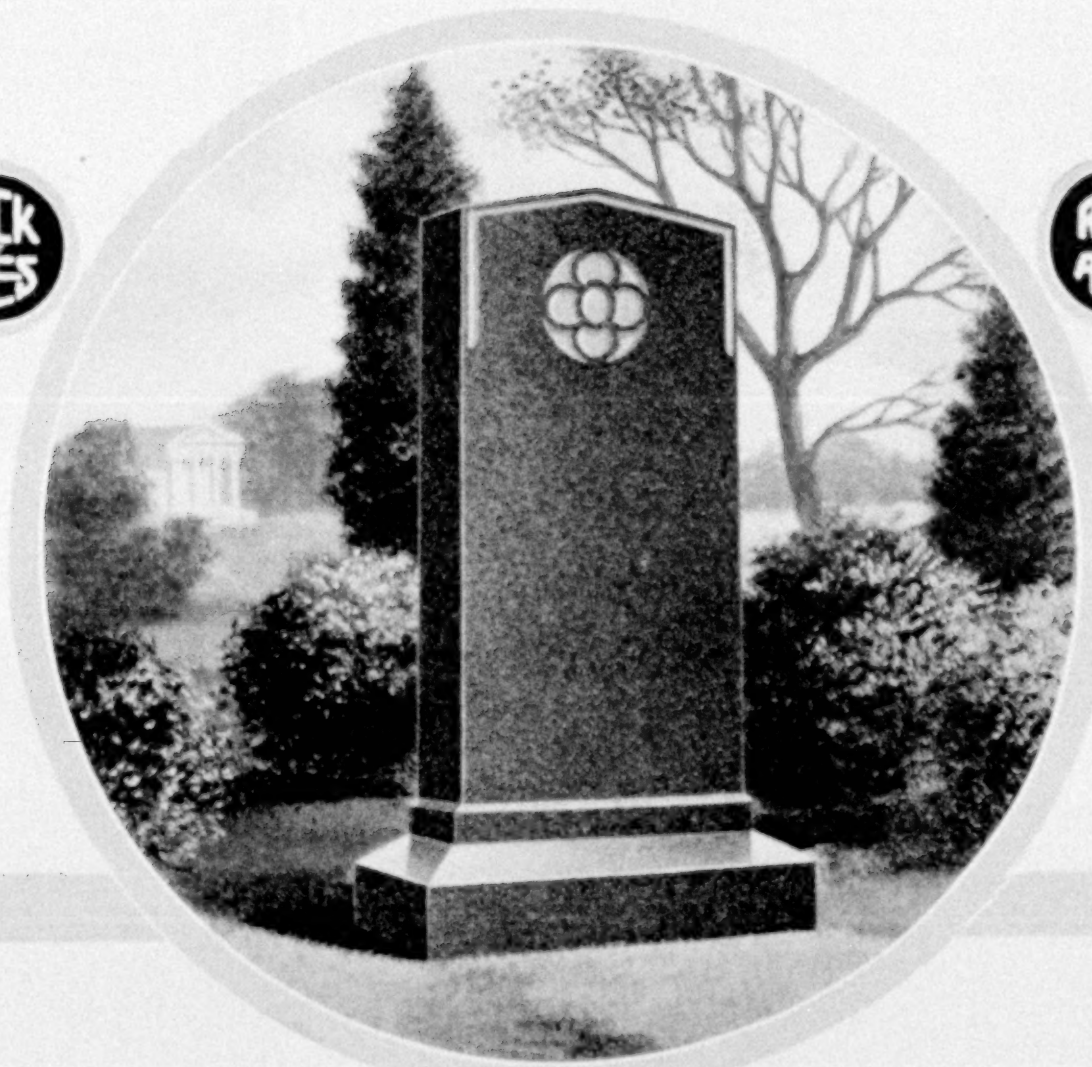

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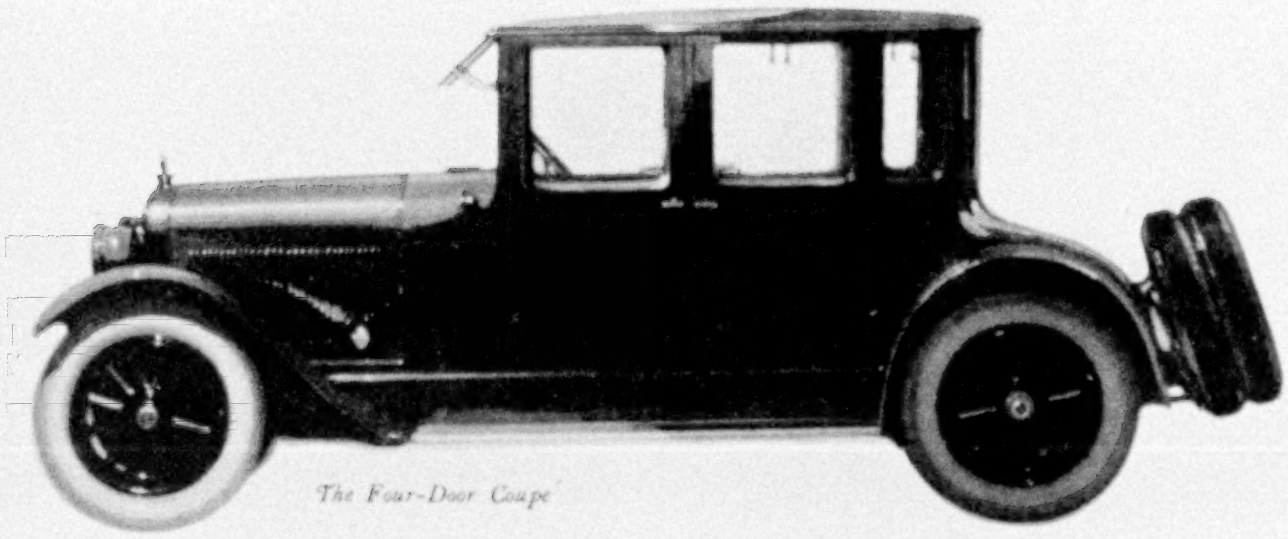

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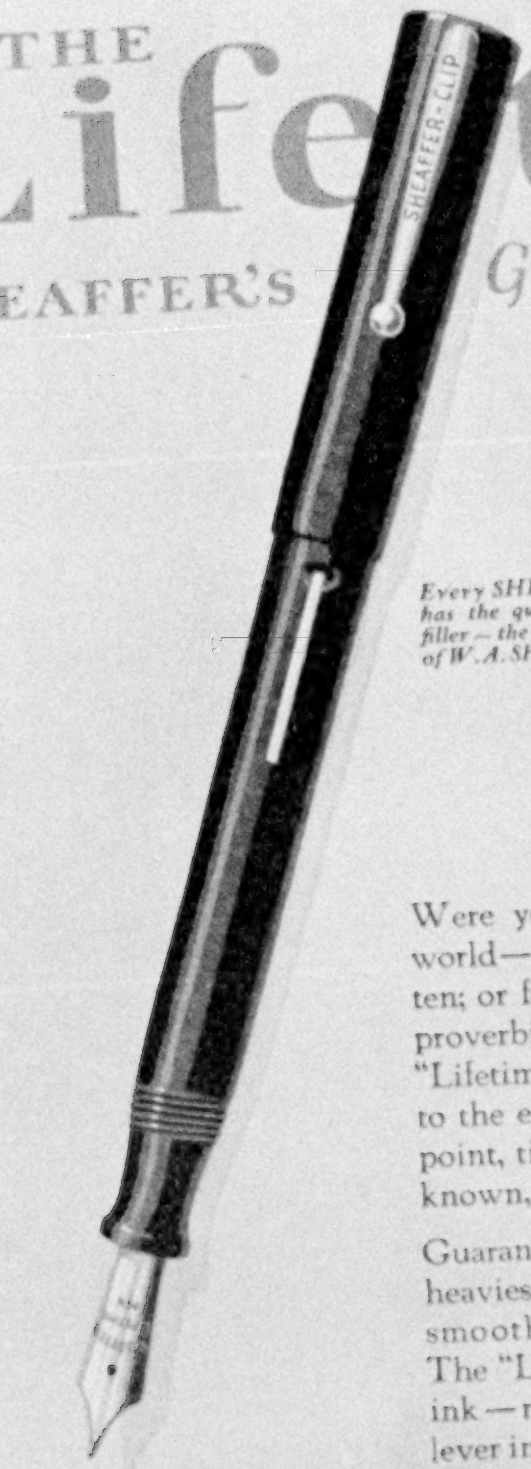
SHEAFFER'S *Greatest Achievement*



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